OMRON

Quality Control & Inspection Guide 2012

For production
that Never Fails!

realizing

Applications examples

Downloads

How it works

Benefits

never-fail.info

Do you know Jack?

Jack is our smart inspector telling you more, to be prepared for today's and tomorrow's inspection challenges. He is facing increasing demands for higher throughput and improved quality. So, if you get stressed about defects in your production process, learn more from Jack about our products. Jack knows the best sensors for machines that never fail.

Test yourself and us. Play with Jack our game and catch the errors. Experience that by using Omron's smart sensors your machine will never fail. Find the perfect solution for your requirements.

Zero defect for production that Never Fails!

Customer satisfaction highly depends on the quality of the finished goods or the performance of the machine in use. Zero defects in production is a key criterion for success. The speed of production lines is getting increasingly faster. On the other hand the machines should never fail. But can you trust the result?

The necessity for quality inspection and control in any production process is no longer a discussion point. The cost of non quality is much higher than the investment, which pays for itself within a short time. In order to further reduce the number and cost of defective goods, there is a clear trend from having just one inspection at the end of the process towards several quality checks within or even at the beginning of the process. This effect further increases the demand for accurate, reliable and fast inspection systems.

Omron offers a complete portfolio of measurement and inspection systems using different technologies and principles, but following the same guideline: keep it simple for the user.

Choose the technology that fits best for the application:

- Machine Vision systems
- Ident systems (Code Readers & RFID)
- Measurement Sensors (laser, inductive, tactile)

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SELECTED INDUSTRY APPLICATIONS

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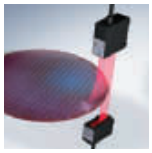

Semiconductor,
Photovoltaic & Electronics
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SPECIAL INSPECTIONS

Inspection on surfaces
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Transparent materials/glass
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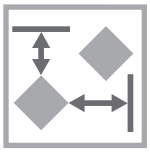

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Profile and 3D inspections
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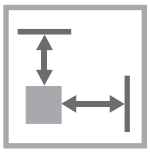

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PRODUCT INFORMATION

Inspection & Ident systems

Vision systems

Easy vision sensor
FQ

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Pick & place vision sensor
FQ-M
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Vision system
Xpectia

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Industry Vision Solution
FlexXpect

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Ident systems

Code reader
FQ-CR1
V400
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RFID
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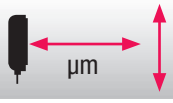
Measurement

Displacement/distance

ZX, ZS

Profile



ZG2

Position/diameter/width

ZX-GT

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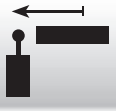
Position detection

Machine part detection



Standard

Rotation

Area monitoring

For more information refer to INDUSTRIAL SENSING GUIDE

INSPECTION IN MATERIAL HANDLING & LOGISTICS

For distribution systems that Never Fail

Versatile inspections have to be performed in logistic processes to ensure content and packaging.

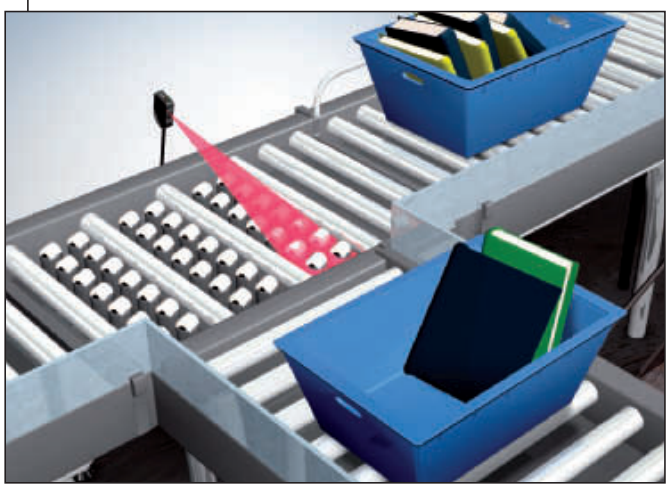
- Avoid wrong content in packages
- Check for proper closure
- Ensure a correct sorting
- Inspection of labels

OBJECT DETECTION

The photoelectric sensors provide accurate detection of passing objects with long operational stability even with changing backgrounds or objects and environmental influences like ambient light, electromagnetic noise or dirt.

TRACKING OF PROCESSES

Trace the material flow within the manufacturing process by V680 RFID system.
- Easy installation
- Diagnostic functions for maintenance



More on photoelectric sensors in the INDUSTRIAL SENSING GUIDE

More on V680 RFID system page 120

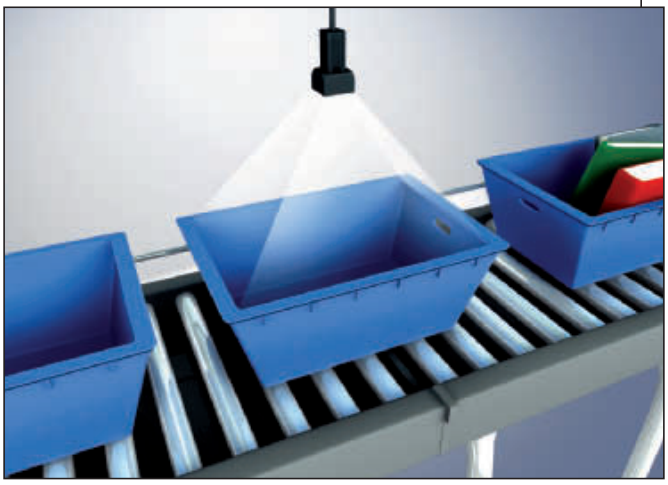
LABEL INSPECTION AND IDENTIFICATION

Inspect the packages for sorting and the correctness of labels
- Read and verify 1D/2D codes
- Character and position inspection

More on Inspection & Ident systems page 30

INSPECTION OF CONTENT

Check the content of boxes with a Vision system.
- Material is complete
- Box is empty



More on FQ Easy vision sensors page 32

INSPECTION IN FOOD PACKAGING

Reliable inspection for flexible machines

Accurate packaging is a key indicator for quality in the food industry. This requires the inspection of seals, caps, labels, dates and patterns. Flexibility in quality control is important to handle different materials, shapes and colours of packages in the process. Platforms offering this flexibility in a user oriented way are mandatory.

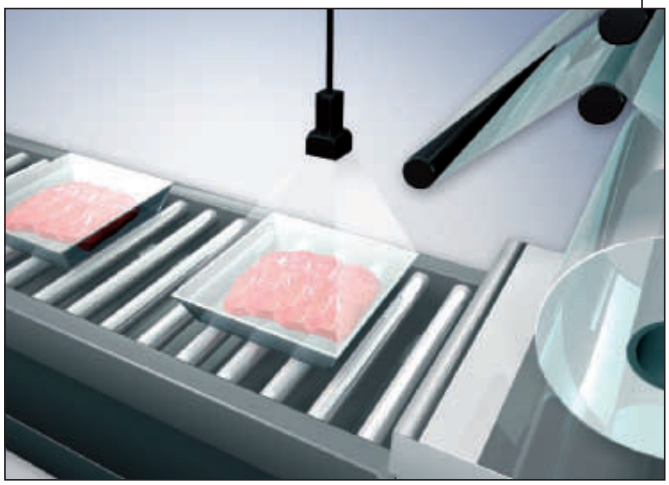
LABEL INSPECTION

Correctly applied labels are mandatory in the food industry. Check with a vision system the label for position, pattern or it is folded. The important information printed on the label needs to be verified. Vision systems or code readers, can check for the presence of the date of expiry or read a code completely.

More on Xpectia lite vision system page 70

INSPECTION OF SEALS

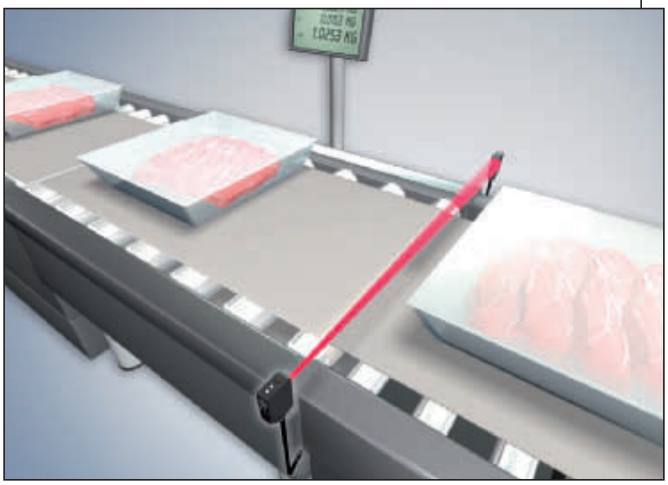
Ensure a proper sealing with Xpectia. One product platform can be used to check a large variety of packaging materials, no matter whether it is transparent, shiny, uneven or is using of different colours and shapes.



More on Xpectia vision system page 80

OBJECT DETECTION

The E3 photoelectric sensors provide accurate detection of passing objects for a wide range of different packaging materials, sizes and shapes and provide longest sensor lifetime even in frequently cleaned environments.



More on photoelectric sensors in the INDUSTRIAL SENSING GUIDE

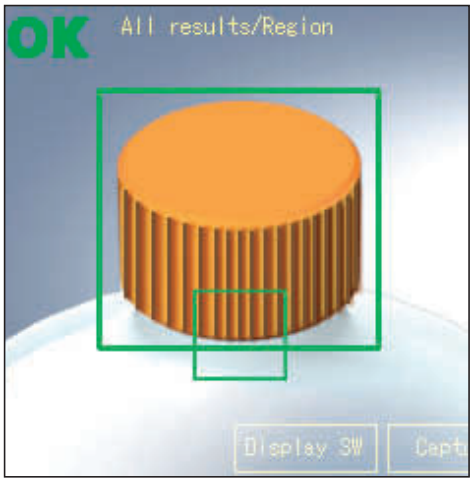
INSPECTION IN THE BEVERAGE INDUSTRY

For flexible production that Never Fails

For beverages and pharmaceuticals the shapes and sizes of containers – especially of PET bottles – are very diverse. Many inspections are necessary along the process to supervise the individual steps. Filling, capping, labeling, palletizing - inspect and monitor the processes with one flexible vision platform, which can be used for all steps, no matter of the diversity.

CAP INSPECTION

Is the right cap on the bottle, or is the cap properly closed? Check from 1 or 2 sides by using FQ or Xpectia lite. The simplicity in use for setup and maintenance reduces operational costs – Touch, Connect & Go



More on FQ Easy vision sensors page 32
For simple cap presence detection see photoelectric sensors in INDUSTRIAL SENSING GUIDE

LABEL INSPECTION

Is the label damaged, folded or not correctly positioned? Several inspections can be performed at the same time. The intuitive user guidance of Omron vision sensors ensures, that no expert knowledge is required anymore for setup & control. Triggered by the E3Z photoelectric sensors highest detection reliability can be guaranteed also for transparent bottles with varying shapes.

More on Xpectia lite vision system page 70
More on transparent object sensors in INDUSTRIAL SENSING GUIDE

INSPECTION IN THE AUTOMOTIVE INDUSTRY

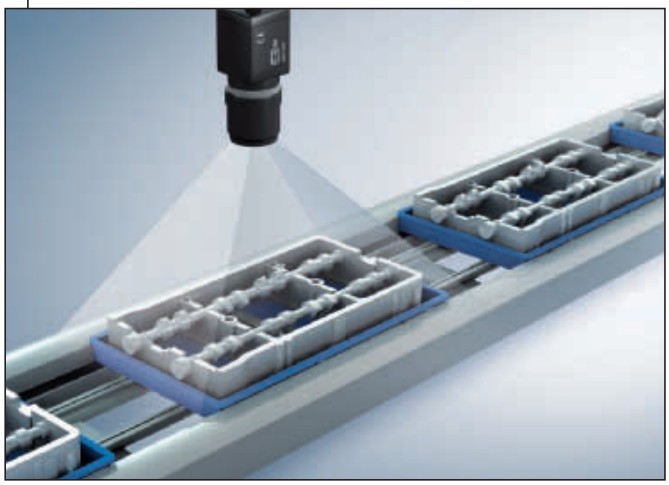
Zero defect production

Producing high quality parts to order for the automotive industry requires quality control within the process, not only at the end. Error-free identification and inspection assures that all parts are within tolerance requirements.

INSPECTION OF LARGE OBJECTS

Check the presence of oil on the cylinder head or the cam shaft. The size of the object requires a high resolution inspection. Xpectia offers:

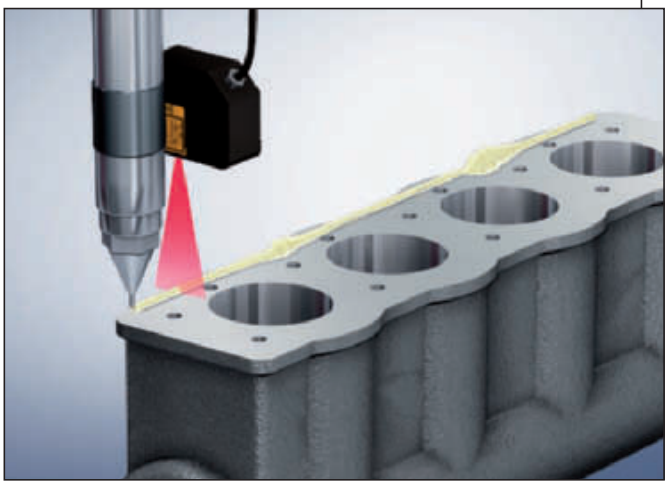
- 5Mpixel resolution
- Detect minute defects due to real colour sensing



More on Xpectia FJ vision system page 80

EASY PROFILE MEASUREMENT

3D glue bead inspection with ZG2 profile sensor. High accuracy combined with ease of use.

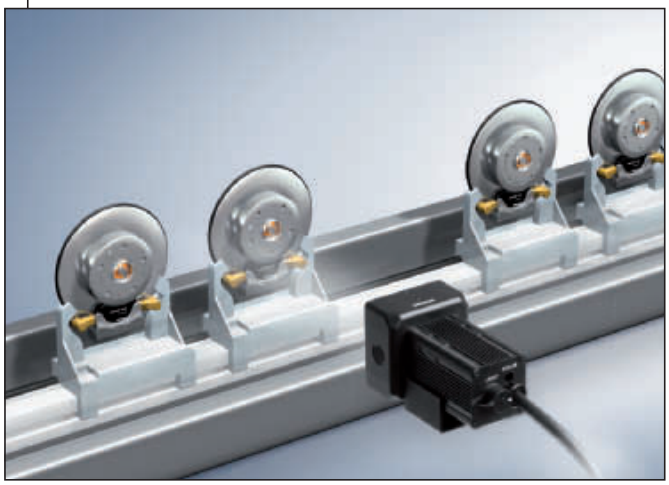


More on ZG2 profile measurement page 158

PART IDENTIFICATION

Verify the correct type of an automotive part, e.g. brakes, to be used in the process.

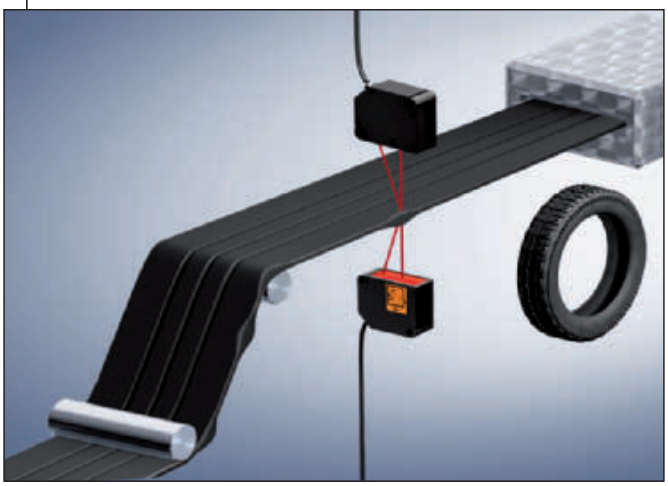
- Characteristic points have to be inspected
- Part colours have to be identified.



More on Xpectia lite vision system page 70
For simple colour identification see E3X-DAC-S in INDUSTRIAL SENSING GUIDE

INSPECTION ON CHALLENGING SURFACES

Thickness measurement on black rubber with the scalable ZS displacement sensor. One sensor for any material.

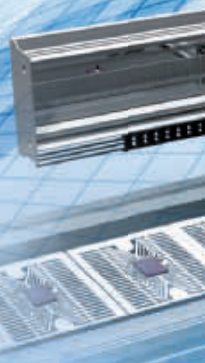


More on ZS displacement measurement page 126

INSPECTION IN THE SEMICONDUCTOR, PHOTOVOLTAIC & ELECTRONICS INDUSTRY

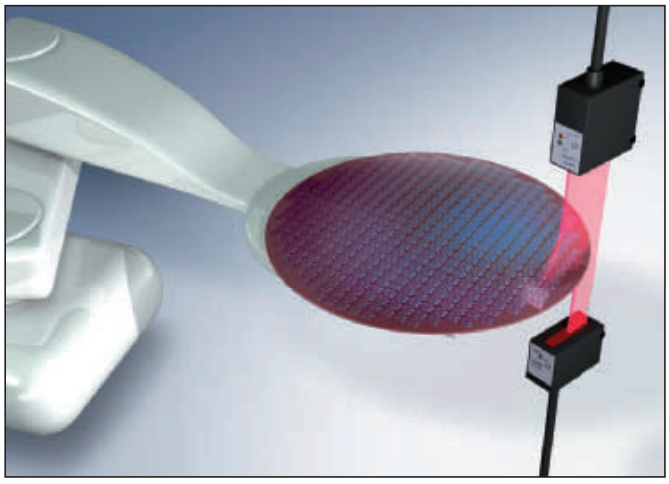
Highest accuracy in production processes

Continuous miniaturisation and higher performance of electronic components and the continuous pressure to increase productivity, requires demanding quality controls.



HIGH ACCURACY MEASUREMENT

Ensure the quality of a wafer: measure the eccentricity with a laser micrometer. Minute differences can be inspected by using CCD technology.

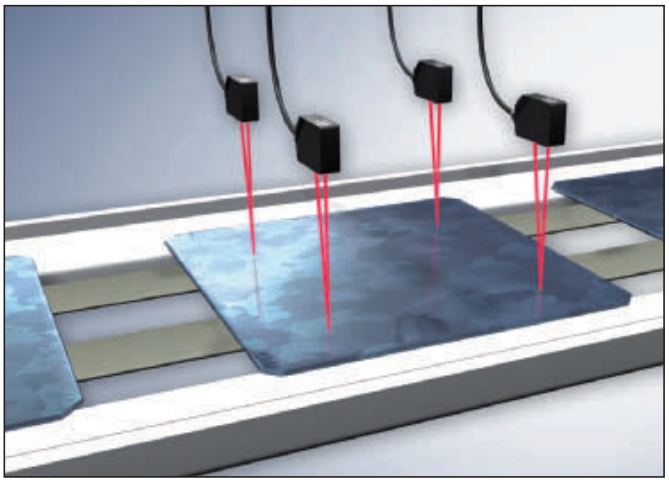


More on ZX-GT laser micrometer page 167
For accurate wafer detection see fiber optic sensors in INDUSTRIAL SENSING GUIDE

PHOTOVOLTAIC SURFACE MEASUREMENT

In the production of solar-wafers several inspections have to be made:

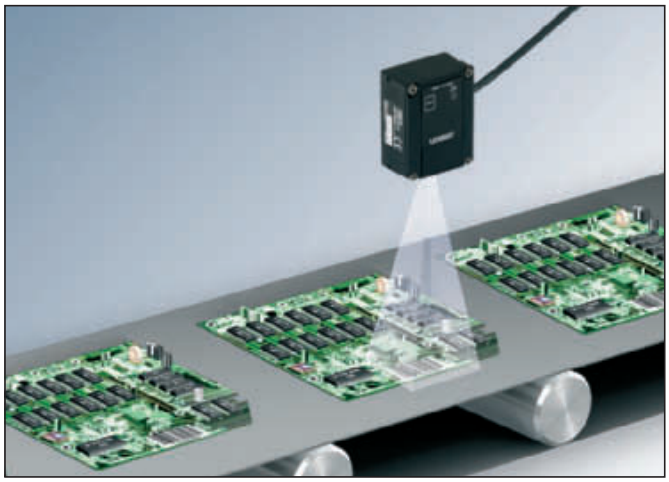
- Accurate warpage measurement of the surface using scalable displacement sensors
- Inspect the structure of wafer surfaces with high resolution vision systems



More on ZS high accuracy displacement measurement page 126

PCB INSPECTION AND IDENTIFICATION

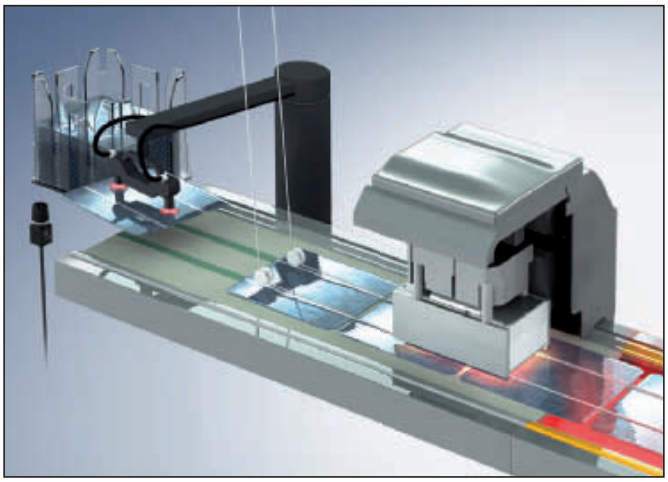
The production of PCBs require the type identification of boards via barcode or datamatrix code. The completeness of the components on the PCB needs to be controlled with a vision system.



More on Inspection and Ident systems page 30
For detection of PCBs see wide beam E3S-LS3 in INDUSTRIAL SENSING GUIDE

PV WAFER INSPECTION

Each step in the production of PV wafers requires:
- Alignment of the wafer
- Inspection for chips and cracks
- Edge breakage



More on FlexXpect-PV on page 102

INSPECTION IN THE PHARMACEUTICAL & HEALTHCARE INDUSTRY

Verification, validation & in-process traceability

The stringent legal requirements in the pharmaceutical industry lead to detailed quality control on drugs and verification of the information printed on the packages. Validation and integrity of process related data is mandatory. Flexible inspection solutions to trace the product and its ingredients in the entire process are the answer to the existing and future legal aspects. Omron's quality inspection systems support:

- FDA CFR21 Part 11
- Track & Trace
- CIP 13 (French coding)
- GMP/GAMP

QUALITY CONTROL FOR MEDICINE

Failure free production requires the verification of different product variants. This includes

- Colour inspection of cans
- Closure control of caps
- Shape and size of containers
- Characteristics on labels
- Control of filling levels

FQ is an easy vision sensor targeting for such inspections

DATE & LOT CODE VALIDATION

The correctness of information on pharmaceutical products is a crucial topic. The verification and validation of 1D/2D codes as well as Date and Batch codes (OCR/OCV) are legally required. Select only one system to inspect both, the quality of the product and the correctness of the codes.

More on FQ easy vision sensor page 32

More on Xpectia FJ vision system page 80

FLEXIBLE AND FUTURE-PROOF

The Pharma industry permanently faces new legal requirements. A future-proof solution, able to integrate new functions (e.g. braille inspection) and applications, ensures to protect the investments. The flexibility of the Omron solution allows to inspect changing models, different country versions, etc. on the same line. This reduces the overall investments and helps to solve any kind of application:

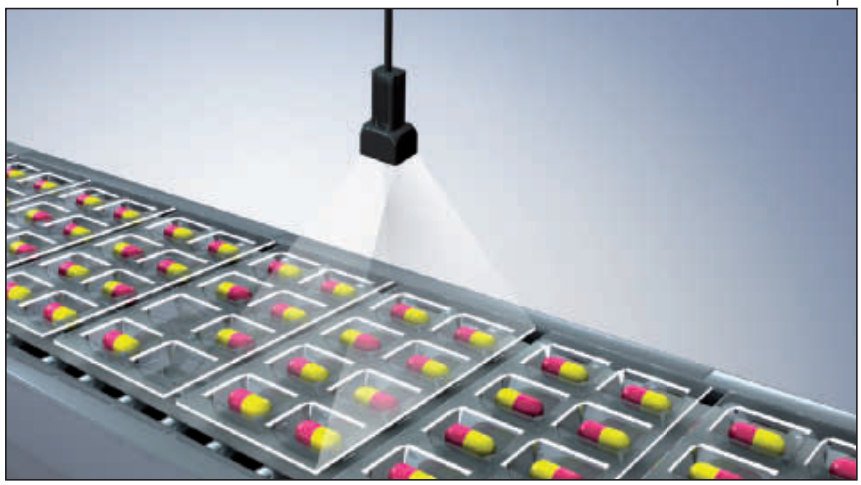
- Packaging inspection
- Blister pack inspection
- Defects and completeness of materials
- Code verifications

CONFORMANCE & APPROVALS

In order to comply to regulations and standards in the Pharma industry and to get system approval it is mandatory to have:

- User administration including different access levels
- Traceability of any user action (Audit trail) with time stamp
- Revision history of program modifications
- Generate readable/printable configuration documents

More on Xpectia FJ vision system page 80
More on FQ easy vision sensor page 32



More on Xpectia lite vision system page 70

INSPECTION OF SURFACES

Different tasks – several solutions

Surface inspections can be versatile, requiring different measurement principles or technologies:

- Check the presence of patterns or characters
- Inspect the structure and shape
- Ensure presence of parts
- Defect detection
- Position of objects

PATTERN RECOGNITION

Search for patterns or characters on the objects in the packaging process. This can require the identification of colour and size of the pattern. The FQ vision sensor can be re-configured easily, without expert knowledge, just Teach & Go.

More on FQ easy vision sensor page 32

WARPAGE INSPECTION

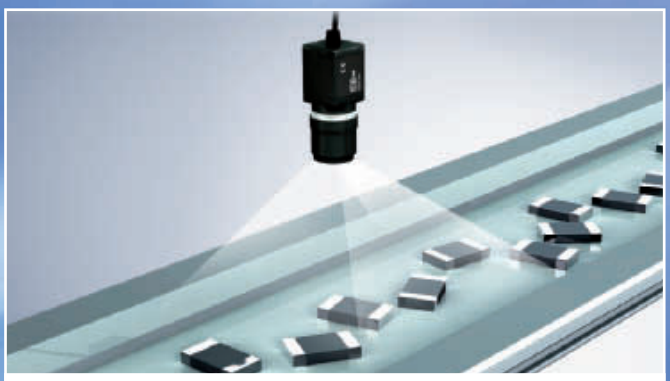
Measure the warpage of any challenging surface, with a scalable displacement sensor. Flexibility is required in the number of sensors and the measurement distance.

More on ZS laser displacement measurement page 126

surface | transparent | edges | profile/3D | position | characters | colour

DEFECT DETECTION

Investigate a surface on defects, which do not correlate with the surroundings. The vision systems can identify minute differences or scratches on the surface. The colour functionality increases the stability of the detection.



More on FQ Easy vision sensors page 32
More on Xpectia lite vision system page 70

PRESENCE OF PARTS

Investigate a surface for the completeness of parts. A vision system is a cost effective solution for the correct placement inspection of components on PCBs.

More on Xpectia lite vision system page 70
More on Xpectia FJ vision system page 80

INSPECTION OF TRANSPARENT OBJECTS & GLASS

High performance on challenging surfaces

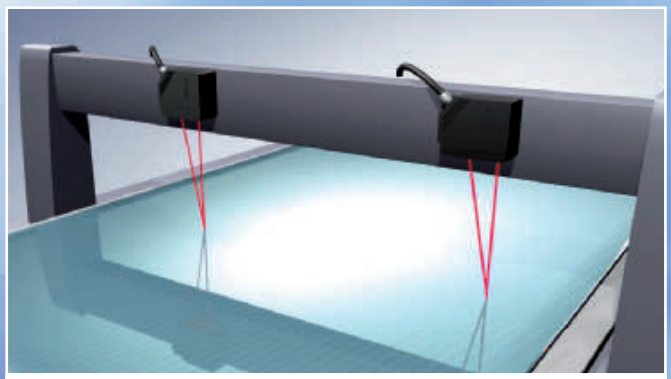
Many quality inspections are necessary in the glass manufacturing process:
- Thickness of glass
- Measurement of layers and coatings
- Detection of defects

The measurement on transparent objects, especially on glass, requires highest performance of the inspection devices.

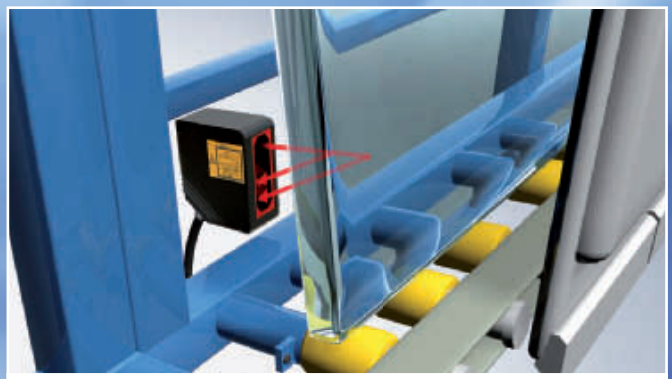
THICKNESS MEASUREMENT OF GLASS

In the flat glass manufacturing process, the thickness has to be checked in many points, to ensure the evenness of the plates.
- Inspect thickness of individual layers
- Check that coatings are equally distributed on the plate

The ZS displacement laser sensor delivers high accuracy on glass and other challenging surfaces. Multiple sensors can be connected to inspect the surface in several points and to calculate the results.
The triangulation reflects the light for each surface (or layer). There is one reflection for the top and one for the bottom surface, which allows to calculate the thickness.



More on high accuracy displacement measurement ZS page 126



More on high accuracy displacement measurement ZS page 126

surface | transparent | edges | profile/3D | position | characters | colour

INSPECT DEFECTS ON BOTTLES

In the beverage or pharmaceutical industry, bottles and bins have to be inspected for defects at the beginning of the process. Xpectia FJ can perform multiple checks, to ensure that the bottle is not defect.

Contour based inspections and fine matching functions allow to detect minute defects on the neck of a bottle or particles on the bottom.

More on Xpectia FJ vision system page 80
For presence detection of bottles see 'transparent object detection' in INDUSTRIAL SENSING GUIDE

INSPECTION OF EDGES

Position and count

The detection and measurement of edges is an important function for quality inspection systems. It can be used to find the position and rotation of objects, or to count for the correct number of edges as a quality criteria. Edge functions are used by vision and measurement systems. They are technical alternatives depending on the application.

INSPECT THE WANDER OF CONTINUOUS MATERIAL

Edge detection is used to monitor the drift of paper rolls or other material in a production line. Depending on the required accuracy several solutions can be realized:

- Simple detection with E3 photoelectric sensors: check whether a defined position on both sides of the paper is crossed
- Precise measurement of the drift: use a profile sensor or laser micrometer to measure with high accuracy the trend of the drift

More on ZG profile measurement page 158
More on E3 photoelectric sensors in INDUSTRIAL SENSING GUIDE

CHECK THE CLOSURE OF COSMETIC BINS

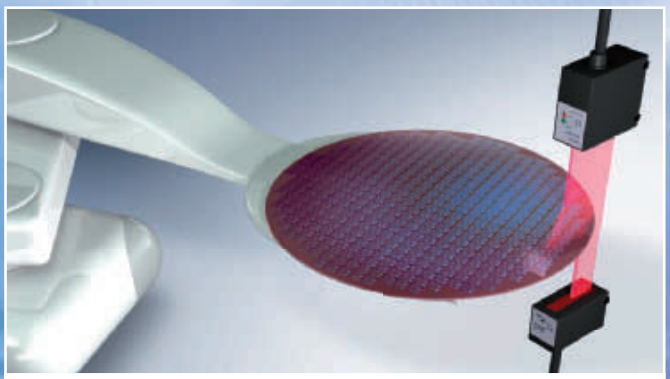
A vision system uses edge tools to inspect whether the cap is properly connected or the closure is locked correctly. FQ fulfills this task and is easy to setup and operate. Changing products on the line, can be easily configured.

More on FQ Easy Vision sensor on page 32

surface | transparent | **edges** | profile/3D | position | characters | colour

ECCENTRICITY OF A WAFER

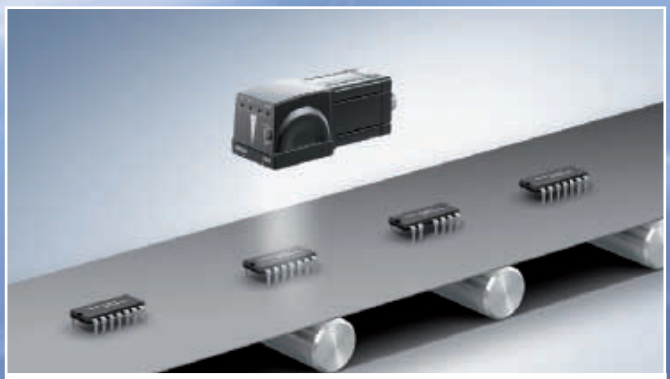
The laser micrometer ZX-GT detects the edge of the wafer. The eccentricity can be measured with high accuracy.



More on ZX-GT laser micrometer page 166
More on fiber optic wafer mapping sensors in INDUSTRIAL SENSING GUIDE

PRESENCE OF PARTS

Verify the number of pins on an IC. An edge tool is used to realize the quality inspection and to identify missing pins with a vision sensor. For simple detections, high precision fiber optic sensors can be used.



More on FQ Easy Vision sensor on page 32
More on E32 fiber optic sensors in INDUSTRIAL SENSING GUIDE

PROFILE AND 3D INSPECTION

Take the quality into the next dimension

The trend for inspection systems is moving from 2 dimensional to 3 dimensional inspections. This increases the quality and stability of the measurement. Important applications are 3D inspections of cars or automotive parts, as well as robot guidance for pick & place.

INSPECTION OF THE CAR BODY

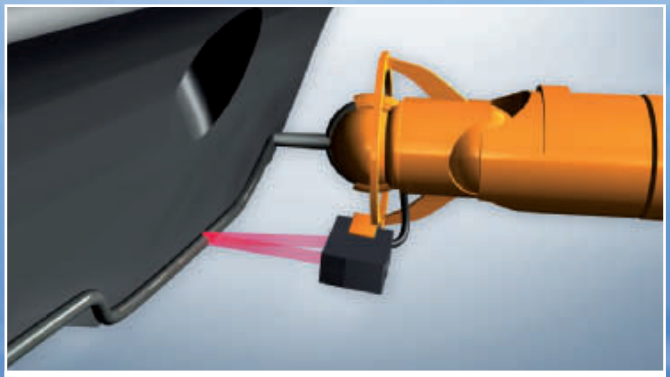
Measurement of gaps and bumps on the car body requires profile or 3D information. Choose the right solution, depending from the required resolution or the number of measurement points in the same area.

- Profile sensor: highest accuracy on a single measurement point. By moving the car or the sensor the measurement can check multiple points or be continuous.
- 3D Vision system: multiple measurements in the whole field of view, without any movements.

More information on ZG2 profile sensor on page 158
More on Xpectia FJ vision system on page 80

GLUE BEAD INSPECTION

Track the proper position and profile of the glue with a profile sensor mounted on the robot.



More information on ZG2 profile sensor on page 158

surface | transparent | edges | **profile/3D** | position | characters | colour

PICKING OF AUTOMOTIVE PARTS

Identify the precise orientation of hanging parts in the press shop, to ensure the correct picking of the part by a robot. Xpectia-FZD analyses the 3D position and orientation.

More on Xpectia FJ vision system page 80

INSPECTION OF A CYLINDER HEAD

In the engine highest accuracy is necessary. 2D inspections of the surface can be combined with 3D inspections to further increase the quality of the parts. Xpectia-FZD combines 2D and 3D in a single platform.

More on Xpectia FJ vision system page 80

DETERMINATION OF POSITION

Pick & place combined with inspection

In many packaging applications it is mandatory to identify the precise position and orientation of a work piece and to communicate this information to the robot, for a proper pick-up. In addition quality inspection of the work piece or on the package is required.

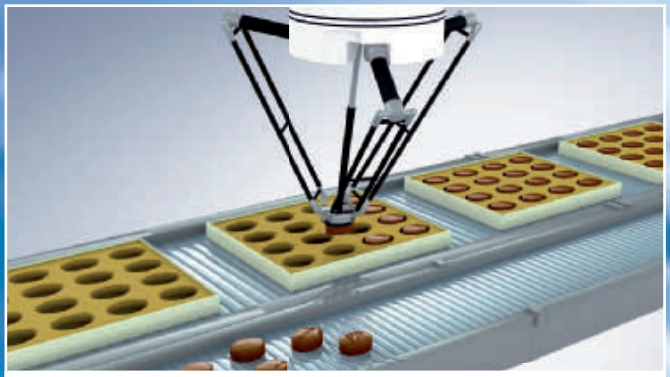
STANDARD PICKING REQUIREMENTS

In many industries, e.g. food packaging the parts on the conveyor can arrive in any position and orientation. The inspection system needs to guide the 'picker' and feed back the coordinates and angle. Multiple parts inside the same image can appear and need to be localised.

More on Pick & place FQ-M page 40
More on Pick & place FZM1 page 58

FILLING OF BLISTERS

A vision system identifies the position of pralines on the conveyor and places them into blisters. After detecting the position, the information has to be communicated to the robot or motion controller. High speed inspection is required to keep pace with the maximum picking speed, which depends on the robot and the food.



More on Pick & place FQ-M page 40
More on Pick & place FZM1 page 58

surface | transparent | edges | profile/3D | **position** | characters | colour

INSPECT AND PICK

A vision system inspects the parts before or after the picking into blisters or boxes.

- Defect or wrong parts are sorted out before picking
- Inspect for completeness and correct parts after picking

Depending on the performance required, inspection and positioning can be performed by one vision sensor. 100% quality can be achieved on naturals and/or on the package.

More on Pick & place FQ-M page 40
More on Pick & place FZM page 58

MOTION MEETS VISION

Advanced machine automation requires the integration of many components. Vision represents a key component for pick & place and will become an integrated part of packaging solutions. The benefits are:

- Easy set-up & calibration
- Integrated communication
- Combine positioning and inspection in one system

More on Pick & place FQ-M page 40
More on Pick & place FZM1 page 58

CHARACTER RECOGNITION

High end OCR/OCV inspection

The inspection or recognition of characters is a standard method in production processes to verify that information printed on labels or parts directly are correct. Depending on the material, background or font, advanced image processing is required for stable and reliable recognitions.

DATE AND LOT CODES ON LABELS

Ensure the correctness of dates, lot codes and other important product information. Especially in Food or Pharma industry, expiration and productions dates on labels and packages are critical for the business and need to be guaranteed.

More on Xpectia FJ vision system page 80

PERSONALIZATION OF CHIP CARDS

The production of credit cards, passports or any other kind of chip card typically contains personalized data. The sensitivity of these products demands 100% failure free printing of all personal information on the cards, as well as highest speed and surface inspection.

More on Xpectia FJ vision system page 80

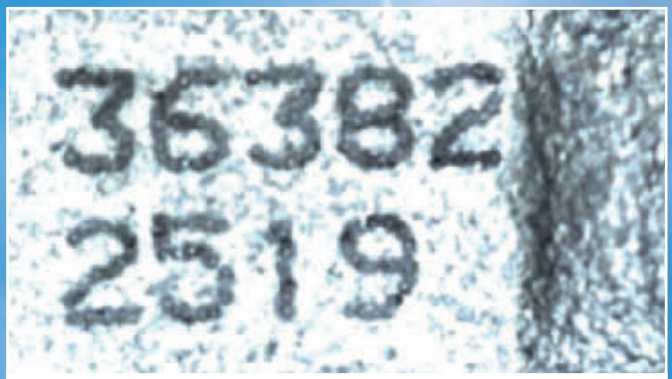
surface | transparent | edges | profile/3D | position | **characters** | colour

RECOGNITION OF DIRECT MARKED CHARACTERS

In automotive or glass industry characters are often marked directly on the part. Stable and reliable inspections on transparent or shiny materials can be realized by Omron Vision Systems, thanks to advanced filtering options.

MASTER ANY CHALLENGE IN RECOGNITION

Characters can be printed or marked in many different ways, fonts, shapes and orientations. The combination of powerful algorithms, filters and real colour processing together with strong OCR/OCV tools achieves highest quality and reliability for character recognition.



More on Xpectia FJ vision system page 80

More on FlexXpect-Pharma/-Labelling page 80

COLOUR INSPECTION AND DETECTION

Colour enables to enter new applications and is another parameter to make conventional quality inspections more stable and robust. Real colour functionality allows vision systems to see like or even more than the human eye.

Omron offers a complete line-up of vision sensors and systems for colour applications, starting from simple colour identification up to real colour inspections to distinguish minute differences in colour. The line-up is complemented by Omron's colour mark sensors for simple, but reliable colour detections.

REAL COLOUR SENSING

Verify the characters printed on coloured pencils. Real colour sensing allows to inspect all pencils, by using a single inspection tool with highest stability. Beside the capability to distinguish minute differences in the colour, it also allows to ignore colour, where it is not of interest or disturbing the verification.

Real colour sensing simplifies the setup & operation, as in many applications images don't need to be filtered anymore and there is no need to setup multiple inspection tools.
Conventional colour vision sensors convert the colour into a filtered grey scale image for processing, which delivers 256 different colours, Omron real colour sensing provides up to 16 million colours to detect minute variations of coloured objects.

More on Xpectia FJ vision system page 80

Standard colour system: Low contrast, internal processing using a filtered monochrome image. Xpectia: High contrast, stable inspections using real-colour sensing

surface | transparent | edges | profile/3D | position | characters | colour

COLOUR IDENTIFICATION

Identify wrong caps on cosmetic bins, by verification of the colour. Bins with wrong caps can be easily sorted out, eaven even if they are very similar. The FQ vision sensor is the ideal solution for simple colour applications.

- Easy setup
- Real colour sensing
- Simultaneous inspection of further quality criteria

EASY COLOUR AND COLOUR MARK DETECTIONS OR VERIFICATION

For best value for money for the detection or verification of colours or coloured marks. OMRON's colour and colour mark sensors provide a reliable, easy-to-use and flexible portfolio to match your application requirements....just choose the performance you need.

- Scalable colour verification solution (choose the nr of channels you need)
- Full flexibility for your mounting requirements

More on FQ easy vision sensor page 32

More on E3X-DAC colour sensor in INDUSTRIAL SENSING GUIDE

INSPECTION & IDENT SYSTEMS

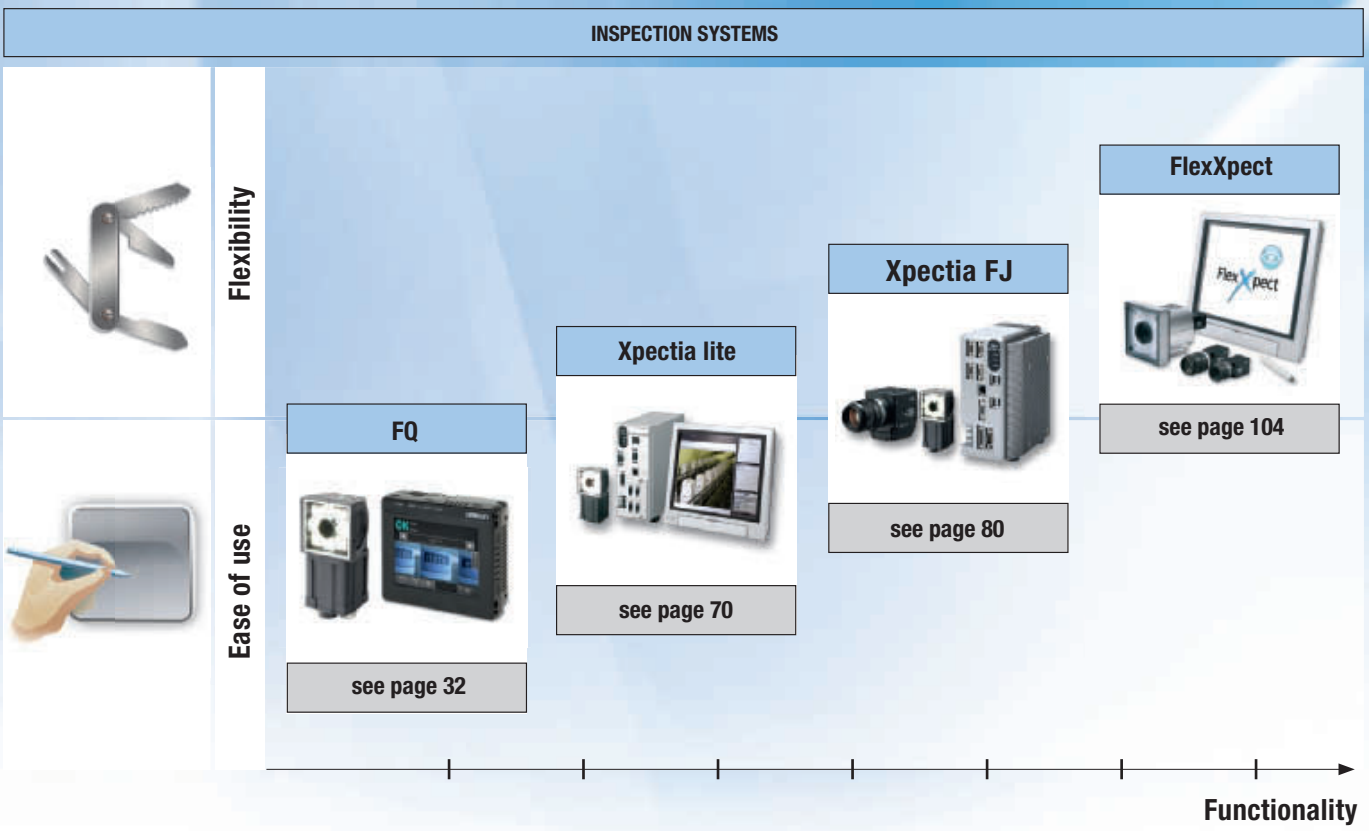
Simplicity and intuitive user guidance

The demand

The necessity for quality inspection and control in any production process is no longer a discussion point. The cost of non quality is much higher than the investment, which pays for itself within a short time. In order to further reduce the number and cost of defective goods, there is a clear trend from having just one inspection at the end of the process towards several quality checks within or even at the beginning of the process. The key technology that fills most inspection requirements is 'Machine Vision', but do all companies have the required know-how for vision applications in-house?

The approach

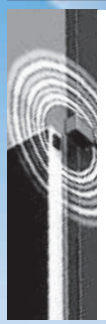
Omron offers a complete portfolio of vision products that solve this problem. Ranging from application-specific vision sensors up to PC-based vision systems, the portfolio has one common design rule: keep it simple.The built in monitors or touch screens are easy to use and avoid an additional PC for setting up while delivering immediate feedback on results. Moreover, users are shielded from the complexity of a vision application by intuitive user guidance that navigates them through the application without the need for expert knowledge on lighting, optics, filtering, etc..



The solution

Furthermore, Omron's platform concept with controllers and cameras allows you to select the best configuration for your application in an easy and flexible way. Choose from the easy vision sensor FQ, which offers an intuitive teach & go procedure. The new mid-range Xpectia lite for advanced applications requiring features such as multiple inspections, position correction, intelligent image filtering and Ethernet communication. For even more challenging applications the high-end Xpectia FJ combines the benefits of a compact system with the flexibility of a PC based platform. For code-reading look no further than the FQ-CR1.

IDENT SYSTEMS (RFID/CODE READER)



RFID

V680

see page 120

2D

V400-H

see page 116

FQ-CR1

see page 114

1D

V500-R5

see page 118

Fixed **Portable**

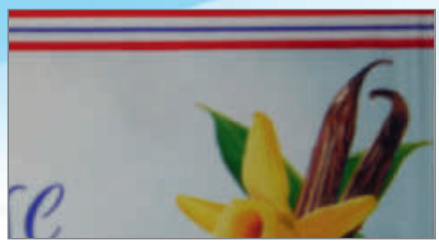
FQ VISION SENSOR

Simply guided & crystal clear

Omron defines a new era of simplicity and performance with the new FQ vision sensor range. Now you can benefit from state-of-the art technology without complex operation instructions or technical knowhow. With one-touch control via PC or the intuitive TouchFinder console, you can access all functions and settings quickly and easily.

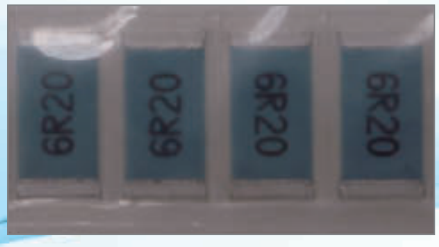
Excellent image quality is achieved from even the most challenging surfaces, with advanced processing tools. And because the FQ Vision Sensor is available in a wide range of models, you won't have to compromise with a choice that has too many or too few features for your needs. So you can be sure of a best-fit solution for your particular application.

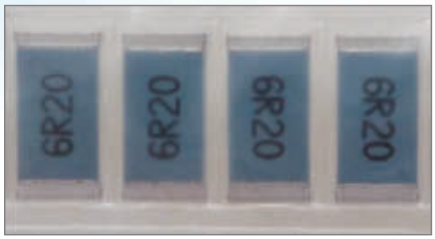
Real colour sensing:



All RGB gradations (16+ million) are processed directly. No grayscale conversion or colour filtering required.

High power lighting:





Contrast was once a major issue in image processing. With the FQ Vision Sensor however, every image is bright and clear, with perfect contrast for reliable results.

HDR sensing:

Variations in lighting conditions can cause unwanted glare or halation. HDR minimizes these effects, maximizing the stability of inspection results, even countering piece-topiece variation or misalignment.

YOUR BENEFITS

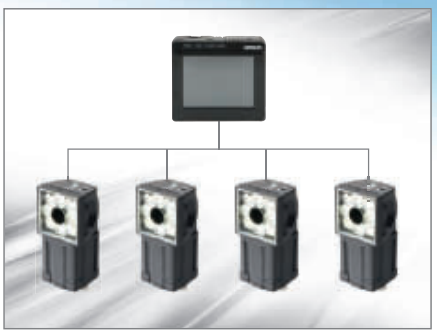
- One-touch control
- Crystal-clear image quality
- Real Colour Processing (16 million colours)
- Operation via PC or handy TouchFinder screen
- Reliable results on any surface
- Remarkable flexibility – always a perfect match and not a compromise for your application

Make it sharp:

High performance LEDs and powerful filtering deliver clear images on even the most difficult surfaces.

Simple guided:

Always know where you are in operation with the simple navigation menu.



Flexible platform:

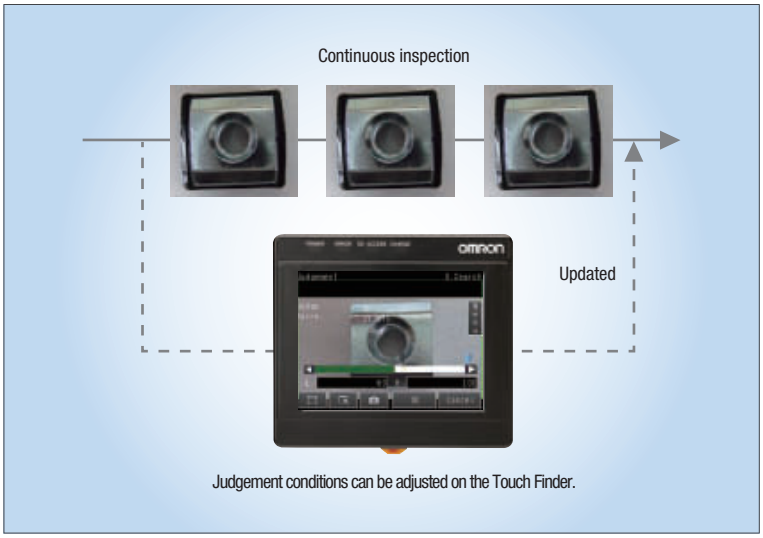
Select the vision sensor that best fits your application and decide how you want to operate it.

Trouble-free Operation On Site

Real-time Threshold Adjustment

The FQ vision sensor allows fast and easy real-time parameter adjustment.

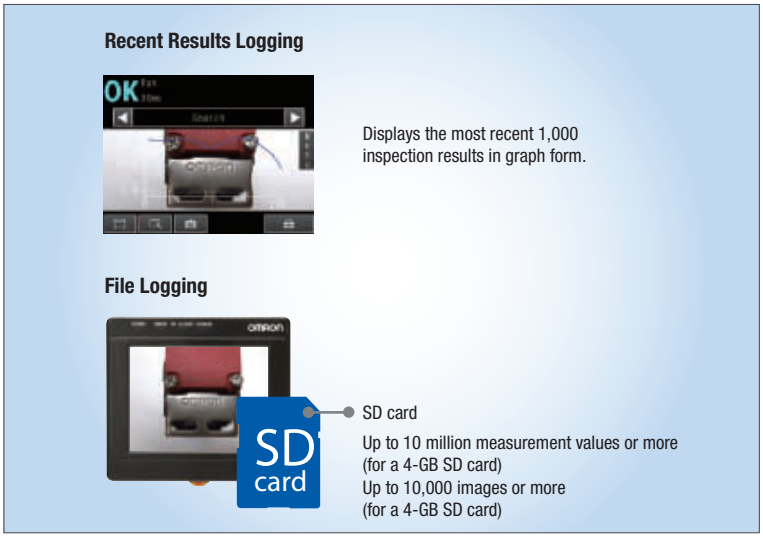
Eliminating the need to stop the machine for fine tuning and optimisation of settings, resulting in zero machine downtime.



Inspection History Logging

Historical results logging is very useful for testing a new line. Samples are fed down the line and inspection results are logged. The logged data can be checked on a time scale in graph form and used to adjust judgement conditions.

File Logging is convenient during operation. Large inspection histories can be saved in SD cards and used later for traceability.


Recent Results Logging
OK
Displays the most recent 1,000 inspection results in graph form.
File Logging
SD card
SD card
Up to 10 million measurement values or more (for a 4-GB SD card)
Up to 10,000 images or more (for a 4-GB SD card)

Auto Detection

When multiple sensors are connected to the Touch Finder, the display automatically switches to the image of the sensor which has produced an NG result.

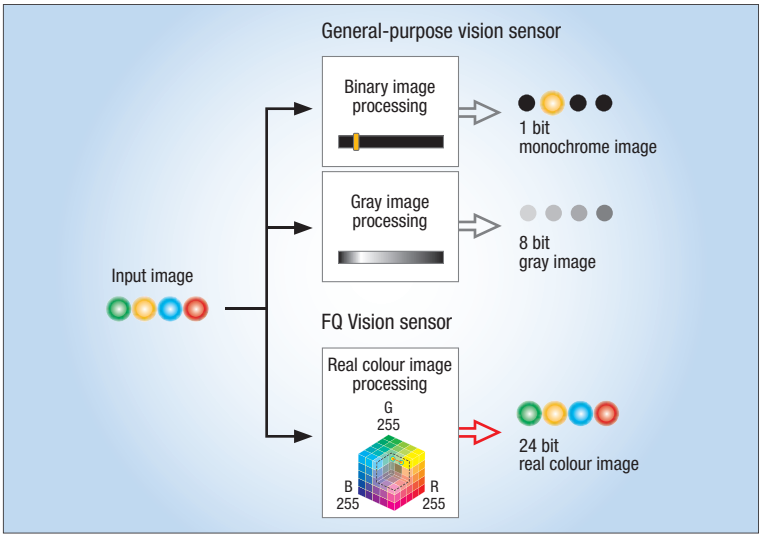
This allows dynamic visualisation of reject conditions.

Authentic Vision Technologies are Gathered on FQ

Real Colour Sensing

Most vision sensors on the market operate using greyscale image processing, due to the high demand of processing colour images. However, many applications may be unsuitable or unstable using greyscale processing due to the requirement of colour inspection or poor image contrast.

In order to offer solutions for such issues, the FQ vision sensor combines a high power processor unit and real-colour processing technology which enables fast inspections using colour images. The same technology is used in Omron's flagship model of vision sensors and is widely utilised throughout industry.

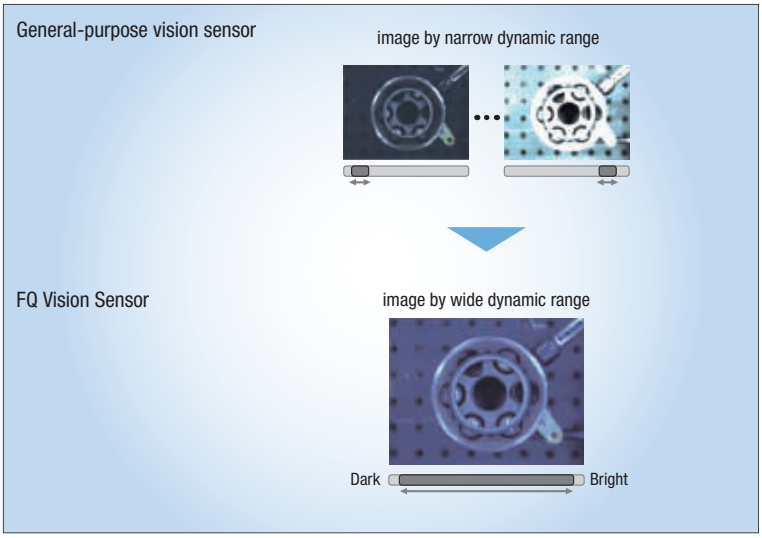


HDR Sensing

Glossy & highly reflective surfaces can often result in "halation" or uneven brightness across an image, coupled with inconsistent workpiece placement inspections can become unstable and unreliable. Such halation is a result of the narrow dynamic range of standard vision sensors.

The FQ vision sensor uses Omron's High Dynamic Range (HDR) processing technology, which increases the dynamic range of the system up to 16 times that of conventional vision sensors.

The result is stable detection of objects which are highly reflective, even if workpiece placement is not consistent.



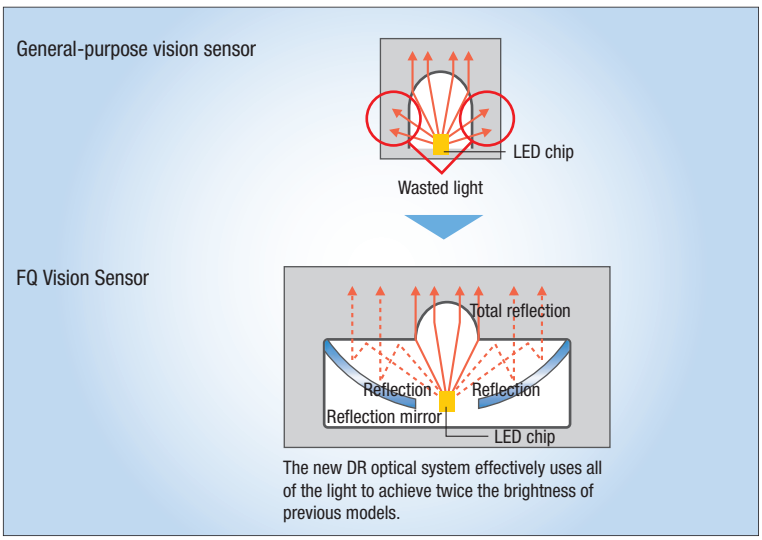
High Power Lighting

Providing suitable illumination for inspections can often be the deciding factor between application success or failure. Especially when inspecting large field of views, even and consistent lighting can be difficult to achieve.

In order to handle such issues, a new DR optical system has been developed for the FQ vision sensor. This system effectively uses all of the LED light to maintain consistent brightness across the field of view at twice the brightness of previous models.

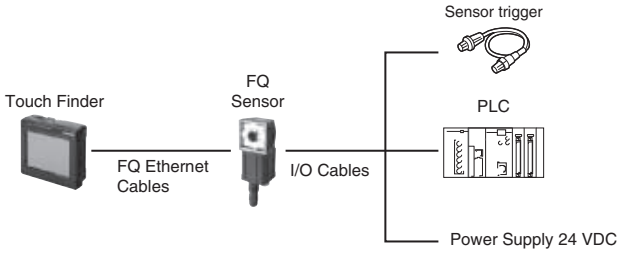
The FQ vision sensor also has a polarisation filter, to cut off the specular reflection light which can result from highly reflective objects, resulting in reliable and consistent inspections.

DR optical system : Double-reflection optical system

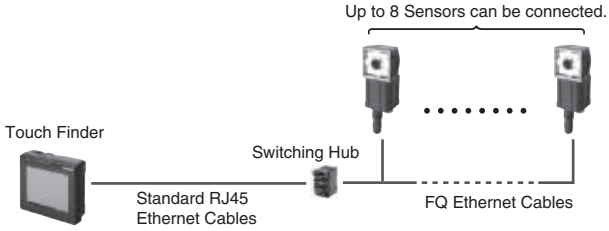


System Configuration

Standard Configuration



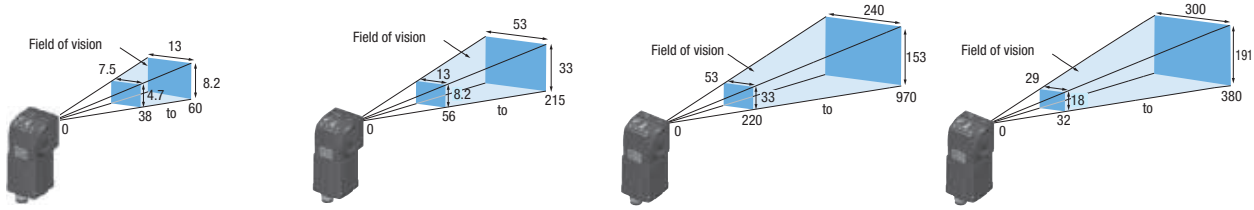
Multiple Connection



Note: If you register as a member after purchasing a Sensor, you can download free setup software that runs on a PC and can be used in place of the Touch Finder. Refer to the member registration sheet for details.

Ordering information

Sensor



Type	Narrow View		Standard		Wide View			
	Single-function models	Standard models	Single-function models	Standard models	Long-distance		Short-distance	
					Single-function models	Standard models	Single-function models	Standard models
NPN	FQ-S10010F	FQ-S20010F	FQ-S10050F	FQ-S20050F	FQ-S10100F	FQ-S20100F	FQ-S10100N	FQ-S20100N
PNP	FQ-S15010F	FQ-S25010F	FQ-S15050F	FQ-S25050F	FQ-S15100F	FQ-S25100F	FQ-S15100N	FQ-S25100N

Note: Tolerance (field of vision): ±10% max.

Touch Finder

Type	Order code
DC power supply	FQ-D30
AC/DC/battery	FQ-D31*1

*1 AC Adapter and Battery are sold separately.

Cables

Type	Cable length	Order code
FQ Ethernet Cables (connect Sensor to Touch Finder, Sensor to PC)	2 m	FQ-WN002-E
	5 m	FQ-WN005-E
	10 m	FQ-WN010-E
I/O Cables	2 m	FQ-WD002-E
	5 m	FQ-WD005-E
	10 m	FQ-WD010-E

Industrial switching hubs (Recommended)

Appearance	Number of ports	Failure detection	Current consumption	Order code
	3	None	0.08 A	W4S1-03B
	5	None	0.12 A	W4S1-05B
		Supported		W4S1-05C

Accessories

Application	Appearance	Name	Order code
For Sensor		Mounting Bracket (enclosed with Sensor)	FQ-XL
		Polarizing Filter Attachment (enclosed with Sensor)	FQ-XF1
For Touch Finder		Panel Mounting Adapter	FQ-XPM
		AC Adapter (for models for DC/AC/Battery)	FQ-AC_*1
		Battery (for models for DC/AC/Battery)	FQ-BAT1
		Touch Pen (enclosed with Touch Finder)	FQ-XT
		Strap	FQ-XH

*1 AC Adapters for Touch Finder with DC/AC/Battery Power Supply. Select the model for the country in which the Touch Finder will be used.

Plug type	Voltage	Certified standards	Order code
C	250 V max.	Europlug	FQ-AC4
BF	250 V max.	UK	FQ-AC5

Specifications

Item	Type	Single-function models	Standard models
Model	NPN	FQ-S10_	FQ-S20_
	PNP	FQ-S15_	FQ-S25_
Field of vision		Refer to the table below.	
Installation distance		Refer to the table below.	
Main functions	Inspection items	Search, area, average colour, edge position, and edge width	
	Number of simultaneous inspections	1	32
	Position compensation	None	Supported
	Number of registered scenes	8	32
Image input	Image processing method	Real colour	
	Image filter	High dynamic range (HDR), polarizing filter (attachment), and white balance	
	Image elements	1/3-inch colour CMOS	
	Shutter	1/250 to 1/30,000	
	Processing resolution	752 x 480	
Lighting	Lighting method	Pulse	
	Lighting colour	White	
Data logging	Measurement data	In Sensor: 1,000 items (If a Touch Finder is used, results can be saved up to the capacity of an SD card.)	
	Images	In Sensor: 20 images (If a Touch Finder is used, images can be saved up to the capacity of an SD card.)	
Measurement trigger		External trigger (single or continuous)	
I/O specifications	Input signals	7 signals • Single measurement input (TRIG) • Command input (IN0 to IN5)	
	Output signals	3 signals • Control output (BUSY) • Overall judgement output (OR) • Error output (ERROR) Note: The three output signals can be allocated for the judgements of individual inspection items.	
	Ethernet specification	100BASE-TX/10BASE-T	
	Connection method	Special connector cables • Power supply and I/O: 1 cable • Touch Finder and computer: 1 cable	
Ratings	Power supply voltage	20.4 to 26.4 VDC (including ripple)	
	Current consumption	2.4 A max.	
Environmental immunity	Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)	
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)	
	Ambient atmosphere	No corrosive gas	
	Degree of protection	IEC 60529 IP67 (with polarizing filter attachment mounted.)	
Materials	Sensor	PBT, PC, SUS	
	Mounting Bracket	PBT	
	Polarizing Filter Attachment	PBT, PC	
	Ethernet connector	Oil-resistance vinyl compound	
	I/O connector	Lead-free heat-resistant PVC	
Weight		Depends on field of vision and installation distance. Refer to the table below.	
Accessories		• Mounting Bracket (FQ-XL) (1) • Polarizing Filter Attachment (FQ-XF1) (1) • Instruction Manual • Quick Startup Guide • Member registration sheet	

Single-function models		Standard models		Field of view*1 (Horizontal x Vertical)	Installation distance	Weight
NPN	PNP	NPN	PNP			
FQ-S10010F	FQ-S15010F	FQ-S20010F	FQ-S25010F	7.5x4.7 to 13x8.2 mm	38 to 60 mm	Approx. 160 g
FQ-S10050F	FQ-S15050F	FQ-S20050F	FQ-S25050F	13x8.2 to 53x33 mm	56 to 215 mm	Approx. 160 g
FQ-S10100F	FQ-S15100F	FQ-S20100F	FQ-S25100F	53x33 to 240x153 mm	Long-distance model: 220 to 970 mm	Approx. 150 g
FQ-S10100N	FQ-S15100N	FQ-S20100N	FQ-S25100N	29x18 to 300x191 mm	Short-distance model: 32 to 380 mm	Approx. 150 g

*1 Tolerance: ±10% max.

Touch Finder

Item			Model with DC power supply	Model with AC/DC/battery power supply
			FQ-D30	FQ-D31
Number of connectable Sensors			8 max.	
Main functions	Types of measurement displays		Last result display, Last NG display, trend monitor, histograms	
	Types of display images		Through, frozen, zoom-in, and zoom-out images	
	Data logging		Measurement results, measured images	
	Menu language		English, German, French, Italian, Spanish, Traditional Chinese, Simplified Chinese, Korean, Japanese	
Indications	LCD	Display device	3.5-inch TFT colour LCD	
		Pixels	320 x 240	
		Display colours	16,777,216	
	Backlight	Life expectancy*1	50,000 hours at 25ºC	
		Brightness adjustment	Provided	
		Screen saver	Provided	
Operation interface	Touch screen	Method	Resistance film	
		Life expectancy*2	1,000,000	
External interface	Ethernet		100BASE-TX/10BASE-T	
	SD card		SDHC-compliant, Class 4 or higher recommended	
Ratings	Power supply voltage		DC power connection: 20.4 to 26.4 VDC (including ripple)	DC power connection: 20.4 to 26.4 VDC (including ripple) AC adapter connection: 100 to 240 VAC, 50/60 Hz Battery connection: FQ-BAT1 Battery
	Continuous operation on Battery*3		---	1.5 h
	Power consumption		DC power connection: 0.2 A	
Environmental immunity	Ambient temperature range		Operating: 0 to 50ºC Storage: -25 to 65ºC (with no icing or condensation)	Operating: 0 to 50ºC when mounted to DIN Track or panel Operation on Battery: 0 to 40ºC Storage: -25 to 65ºC (with no icing or condensation)
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
	Ambient atmosphere		No corrosive gas	
	Degree of protection		IEC 60529 IP20 (when SD card cover, connector cap, or harness is attached)	
Weight			Approx. 270 g (without Battery and hand strap attached)	
Materials			Case: ABS, Hand strap: Nylon	
Accessories			Touch Pen (FQ-XT), Instruction Manual	

*1 This is a guideline for the time required for the brightness to diminish to half the initial brightness at room temperature and humidity. The life of the backlight is greatly affected by the ambient temperature and humidity and will be shorter at lower or higher temperatures.
*2 This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions.
*3 This value is only a guideline. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

Battery Specifications

Item	FQ-BAT1
Battery type	Secondary lithium ion battery
Nominal capacity	1,800 mAh
Rated voltage	3.7V
Ambient temperature range	Operating: 0 to 40ºC Storage: -25 to 65ºC (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)
Charging method	Charged in Touch Finder (FQ-D31). AC adapter (FQ-AC_) is required.
Charging time*1	2.5 h
Battery backup life*2	300 charging cycles
Weight	50 g max.

*1 This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions
*2 This is a guideline for the time required for the capacity of the Battery to be reduced to 60% of the initial capacity. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

System Requirements for PC tool for FQ

The following Personal Computer system is required to use the software.

OS	Microsoft Windows XP Home Edition/Professional SP2 or higher*1 Microsoft Windows 7 Home Premium or higher*1
CPU	Core 2 Duo 1.06 GHz or the equivalent or higher
RAM	1GB min.
HDD	500 MB min. available space*2
Monitor	1,024 x 768 dots min.

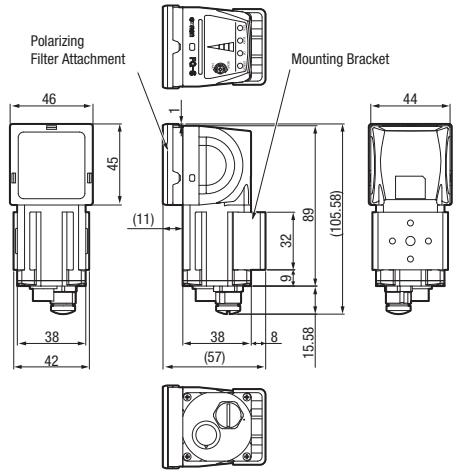
*1 The Japanese and English versions support only 32-bit OS versions.
*2 Available space is also required separately for data logging.

Dimensions

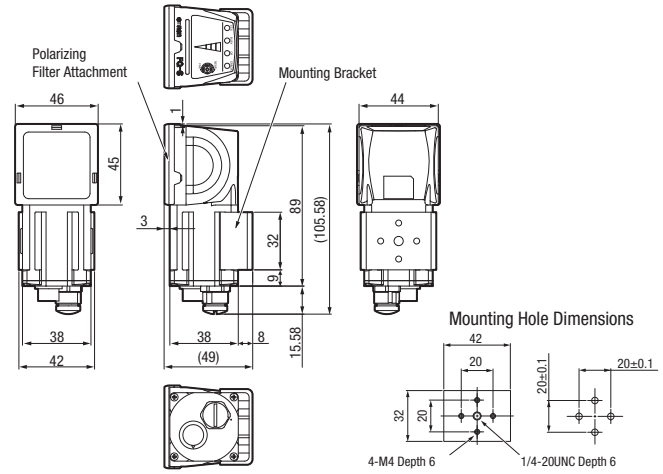
(Unit: mm)

Sensor

FQ-S10010F/-S10050F/-S15010F/-S15050F
FQ-S20010F/-S20050F/-S25010F/-S25050F

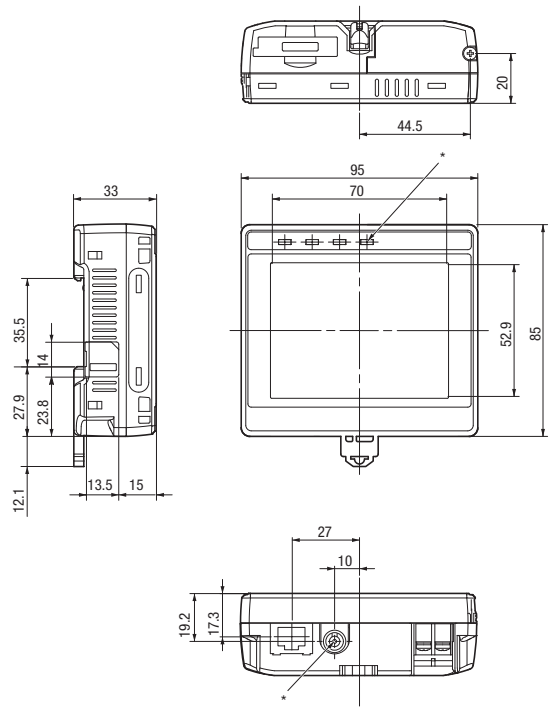


FQ-S10100F/-S10100N/-S15100F/-S15100N
FQ-S20100F/-S20100N/-S25100F/-S25100N



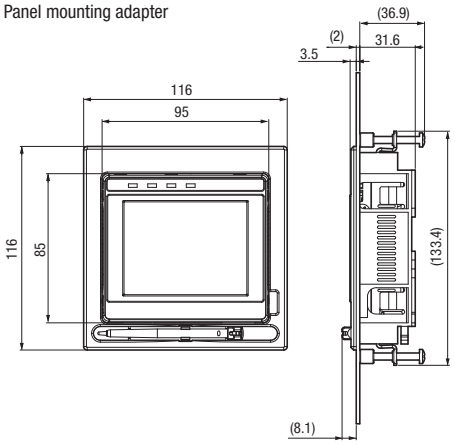
Touch Finder

FQ-D30/-D31

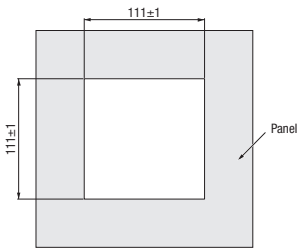


* Provided with FQ-D31 only.

Panel mounting adapter



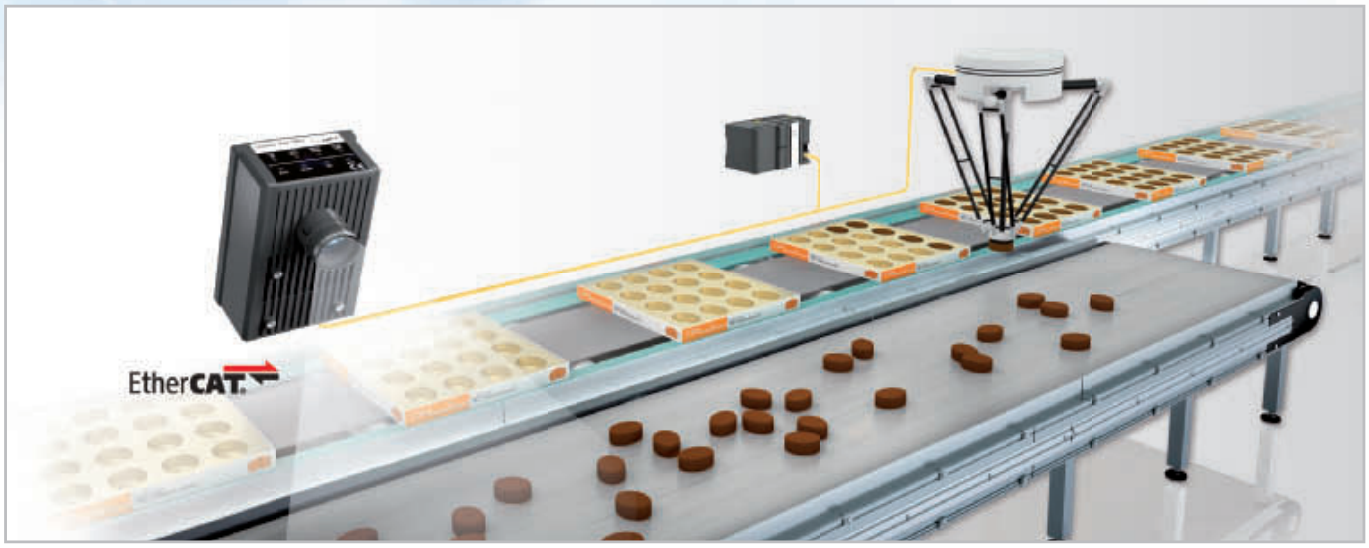
Panel cutout dimensions



FQ-M VISION SENSOR

Smart camera to guide your robot

The new FQ-M series is a vision sensor designed specifically for Pick & Place applications. It comes with EtherCAT embedded and can be integrated easily into any environment. The FQ-M is compact, fast and includes an incremental encoder input for easy tracking calibration. Omron's Sysmac Studio software is the perfect tool for configuring the FQ-M and is complemented by the TouchFinder console for on-site monitoring.



Easy set-up & integration

With intelligent wizards for calibration and communication integration into your machine is easier than ever.
The FQ-M communicates with all devices via EtherCAT, or standard Ethernet. The communication wizard lets you easily configure any robot protocol both as a server or as a client without complex programming.

Fast detection & high stability

The FQ-M can detect up to 32 pieces at once and more than 5000 pieces per minute. The new contour based search algorithm ensures the highest reliability.

„On-the-fly" tracking

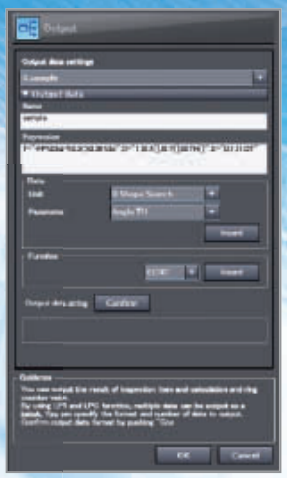
Synchronized control is even easier, because the FQ-M vision sensor has an in-built encoder input for accurate conveyor tracking and easy calibration. The FQ-M is able to output position coordinates and the correlative encoder values and is able to manage the object queue, so that no object's coordinates are duplicated.

YOUR BENEFITS

- Made specifically for pick & place applications
- Encoder input for conveyor tracking and calibration
- Shape based object detection
- Smart calibration wizard
- Sysmac Studio software for vision system operation and setting

FQ-M VISION SENSOR

Easy set-up & integration with motion



Programable out put format for your pick & place robot

Configuration as a server or as a client without complex programming.

Ethernet

Sysmac Studio for fast configuration

The Vision Editor of the Sysmac Studio software will help you to program the optimum vision setting. Intuitive and icon driven set-up and configuration.

TouchFinder for monitoring on-site

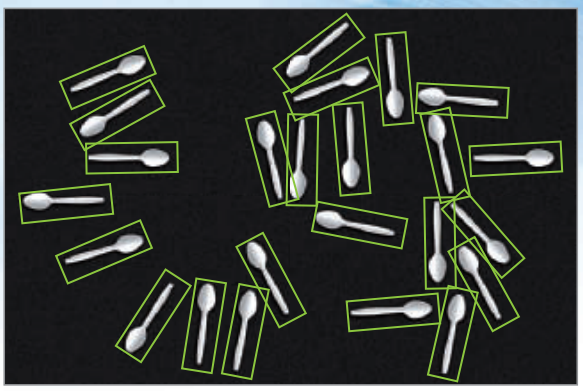
With the intuitive TouchFinder console – which fits in the palm of your hand – you can access all functions and settings quickly and easily.

FQ-M VISION SENSOR

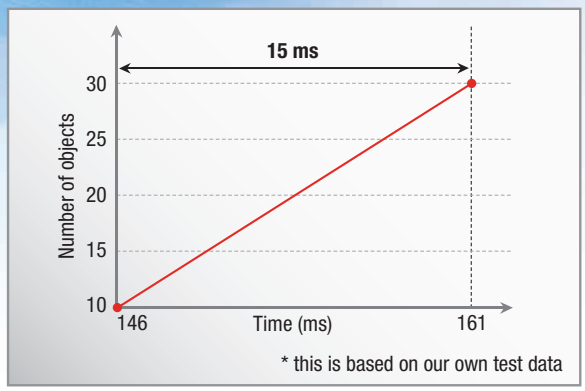
Fast detection and high stability

The new contour based search algorithm offers unique performance for pick & place applications. Changing lighting conditions, reflection, object inclination or partially hidden objects are no longer a problem. The FQ-M delivers a stable result even at high speed, no matter how many objects have to be detected at the same time.

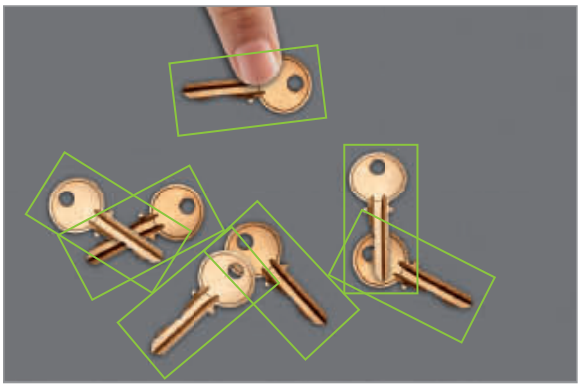
Best in class performance



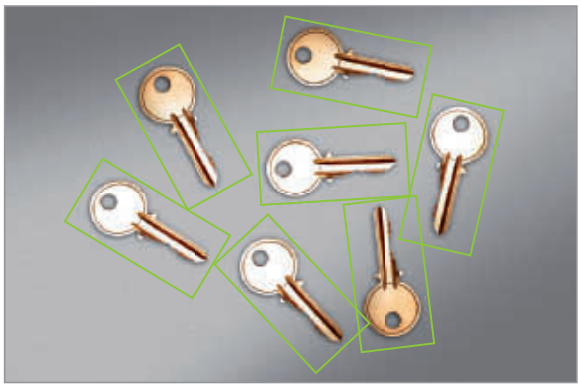
High-speed processing
5000 pcs/min with 360° detection.



Only 15 ms time difference, detecting 10 objects or 30 objects at once.

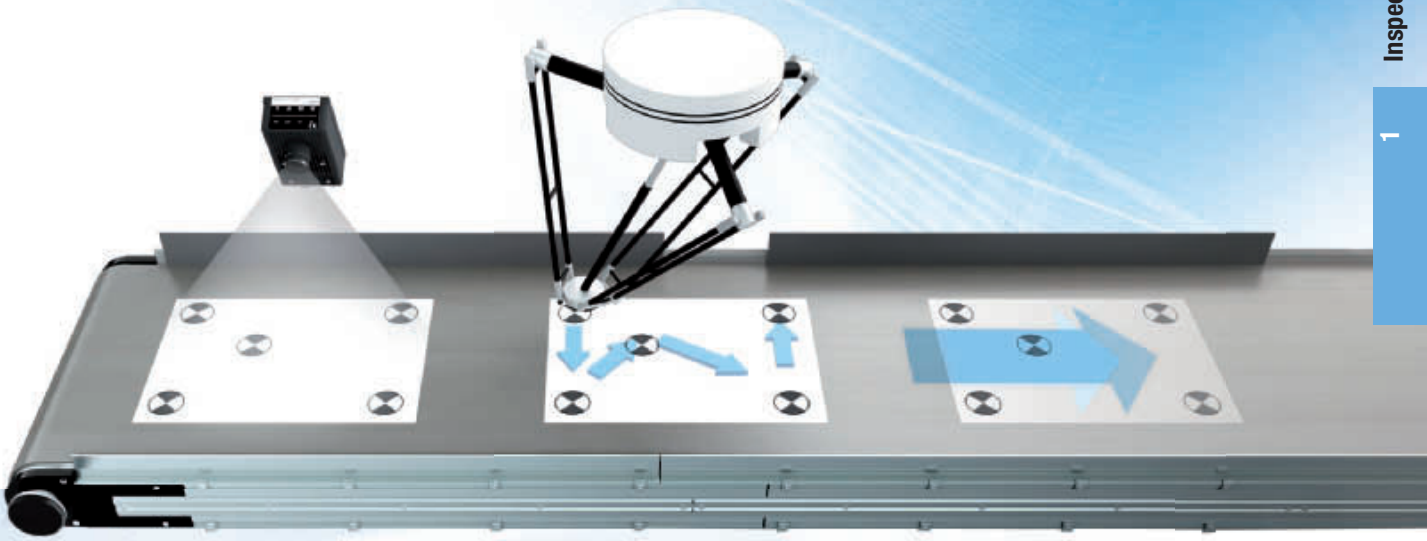


Stable and reliable detection, even if objects are overlapped or partially hidden.



Changing light conditions have no influence on the position accuracy.

Encoder input for simplified calibration & tracking



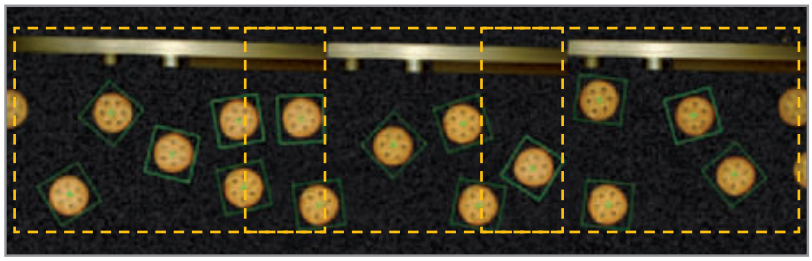
Step 1 – camera
Camera detects all calibration marks.

Step 2 – robot
Robot moves to the calibration marks. The offset to the camera is registered through the encoder value.

Step 3 – system
Camera, conveyor, robot and encoder are automatically aligned.

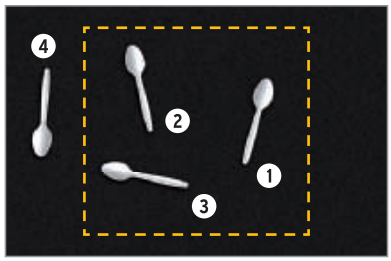
Panorama view – Parameter setting for ideal object detection

A panoramic view can be created from 3 different images, allowing easy parameter optimisation.

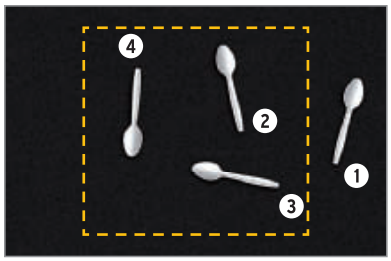


First shot Second shot Third shot

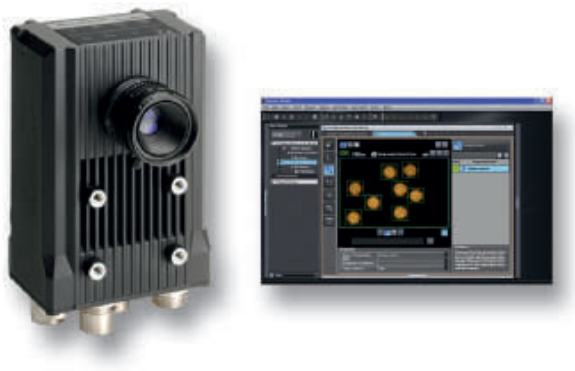
Objects that overlap within more than one field of view are segregated and only inserted in the picking queue once.



First shot
The position and orientation of objects 1, 2 and 3 is detected and added to the picking queue.



Next shot
Object 2, 3 and 4 are detected, but only the data of object 4 is evaluated. Position and orientation of objects 2 and 3 is ignored because they were already added to the queue with the shot before.



FQ-M Vision sensor

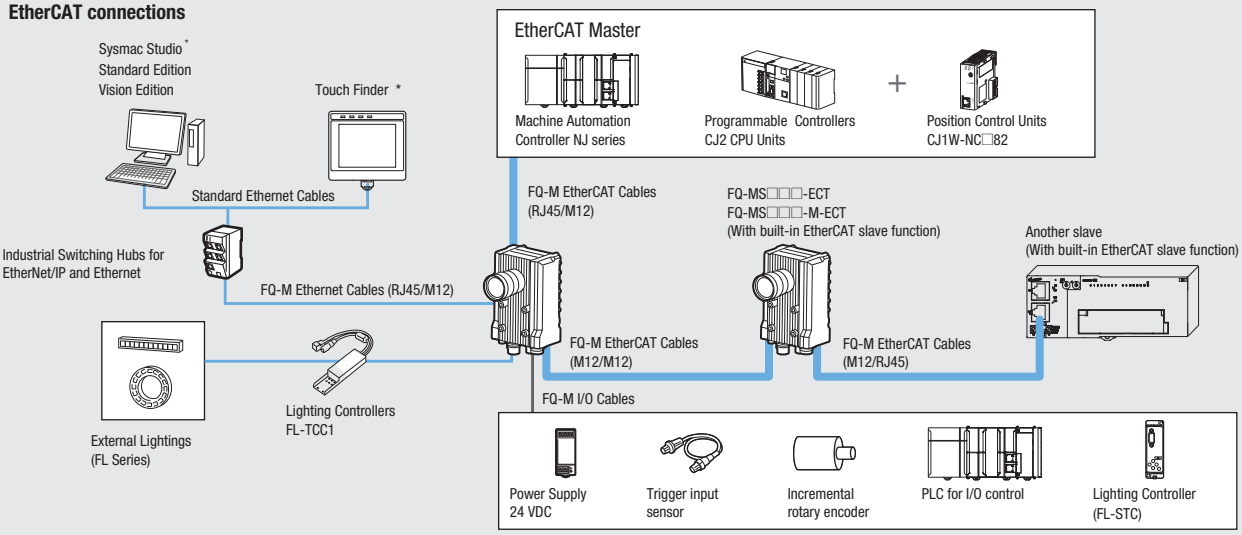
The new FQ-M series is a vision sensor designed specifically for Pick & Place applications. It comes with EtherCAT embedded and can be integrated easily into any environment. The FQ-M is compact, fast and includes an incremental encoder input for easy tracking calibration. Omron's Sysmac Studio software is the perfect tool for configuring the FQ-M and is complemented by the TouchFinder console for on-site monitoring.

Designed for motion tracking

- Made specifically for pick & place applications
- Connectivity with EtherCAT/Ethernet
- Encoder input for conveyor tracking and calibration
- Shape based object detection
- Smart calibration wizard
- Sysmac Studio software for vision system operation and setting

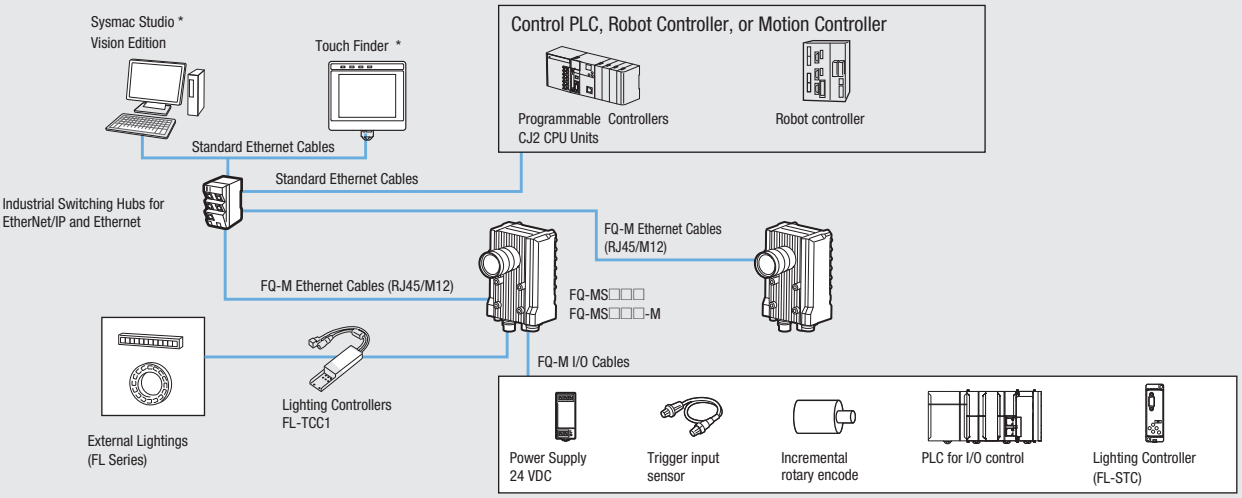
System configuration

EtherCAT connections



* Sysmac Studio and Touch Finder can not be used together. When both are connected, Sysmac Studio will have a priority.
When you use the Sysmac Studio Standard Edition and connect the FQ series and the Machine Automation Controller NJ-series, connect them with a general-purpose Ethernet cable or a USB cable.

No-protocol Ethernet and PLC Link Connections



* Sysmac Studio and Touch Finder can not be used together.
When both are connected, Sysmac Studio will have a priority.

Note: 1. EtherCAT and Ethernet (PLC Link) can not be used simultaneously.
2. It is not possible to configure and adjust the FQ-M via an NJ-series controller, when they are connected via an EtherCAT network. For configuration and adjustment of FQ-M, connect the FQ-M and a computer or a Touch Finder via an Ethernet network.

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Other company names and product names in this document are the trademarks or registered trademarks of their respective companies.

Ordering Information

Sensors

Appearance	Type			Model
	Color	NPN	EtherCAT communication function not provided	FQ-MS120
		PNP		FQ-MS125
	Monochrome	NPN		FQ-MS120-M
		PNP		FQ-MS125-M
	Color	NPN	EtherCAT communication function provided	FQ-MS120-ECT
		PNP		FQ-MS125-ECT
	Monochrome	NPN		FQ-MS120-M-ECT
		PNP		FQ-MS125-M-ECT

Automation Software Sysmac Studio

Please purchase a DVD and required number of licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. Each model of licenses does not include any DVD.

Product name	Specifications	Number of licenses	Media	Model	Standards
Sysmac Studio Standard Edition Ver.1.□□[*1]	The Sysmac Studio provides an integrated development environment to set up, program, debug, and maintain NJ-series Controllers and other Machine Automation Controllers, as well as EtherCAT slaves. Sysmac Studio runs on the following OS. Windows XP (Service Pack 3 or higher, 32-bit version) / Vista (32-bit version)/7 (32-bit/64-bit version) The Sysmac Studio Standard Edition DVD includes Support Software to set up EtherNet/IP Units, DeviceNet slaves, Serial Communications Units, and Support Software for creating screens on HMIs (CX-Designer). For details, refer to the Sysmac Integrated Catalogue (P072).	– (Media only)	DVD	**SYSMAC-SE200D**	–
		1 license[*2]	–	**SYSMAC-SE201L**	–
Sysmac Studio Vision Edition Ver.1.□□	Sysmac Studio Vision Edition is a limited license that provides selected functions required for Vision Sensor FQ-M settings. Because this product is a license only, you need the Sysmac Studio Standard Edition DVD media to install it.	1 license	–	**SYSMAC-VE001L**	–

[*1] The FQ-M series is supported by Sysmac Studio version 1.01 or higher.
[*2] Multi licenses are available for the Sysmac Studio (3, 10, 30, or 50 licenses).

Touch Finder

Appearance	Type	Model
	DC power supply	FQ-MD30
	AC/DC/battery[*1]	FQ-MD31

[*1] AC Adapter and Battery are sold separately.

Bend resistant Cables for FQ-M Series

Appearance	Type			Model
	For EtherCAT and Ethernet cable Angle: M12/ Straight: RJ45		Cable length: 5 m	FQ-MWNL005
			Cable length: 10 m	FQ-MWNL010
	For EtherCAT and Ethernet cable Straight type (M12/RJ45)		Cable length: 5m	FQ-WN005-E
			Cable length: 10 m	FQ-WN010-E
	For EtherCAT cable Angle type (M12/M12)		Cable length: 5 m	FQ-MWNEL005
			Cable length: 10 m	FQ-MWNEL010
	For EtherCAT cable Straight type (M12/M12)		Cable length: 5m	FQ-MWNE005
			Cable length: 10 m	FQ-MWNE010
	I/O Cables	Angle type	Cable length: 5 m	FQ-MWDL005
			Cable length: 10 m	FQ-MWDL010
		Straight type	Cable length: 5 m	FQ-MWD005
			Cable length: 10 m	FQ-MWD010

Accessories

Appearance	Type		Model
	For Touch Finder	Panel Mounting Adapter	FQ-XPM
		AC Adapter (for models for DC/AC/Battery)	FQ-AC□[*1]
		Battery (for models for DC/AC/Battery)	FQ-BAT1
		Touch Pen (enclosed with Touch Finder)	FQ-XT
		Strap	FQ-XH
		SD Card (2 GB)	HMC-SD291

[*1] AC Adapters for Touch Finder with DC/AC/Battery Power Supply. Select the model for the country in which the Touch Finder will be used.

Plug type	Voltage	Certified standards	Model
A	125 V max.	PSE	FQ-AC1
		UL/CSA	FQ-AC2
	250 V max.	CCC mark	FQ-AC3
C	250 V max.	–	FQ-AC4
BF	250 V max.	–	FQ-AC5
O	250 V max.	–	FQ-AC6

Industrial Switching Hubs for EtherNet/IP and Ethernet

Appearance	Number of ports	Failure detection	Current consumption	Model
	3	None	0.22 A	W4S1-03B
	5	None	0.22 A	W4S1-05B
		Supported		W4S1-05C

Note: Industrial switching hubs are cannot be used for EtherCAT.

EtherCAT junction slaves

Appearance	Number of ports	Power supply voltage	Current consumption	Model
	3	20.4 to 28.8 VDC (24 VDC -15 to 20%)	0.08 A	GX-JC03
	6		0.17 A	GX-JC06

Note: 1. Please do not connect EtherCAT junction slave with OMRON position control unit, Model CJ1W-NC□81/□82.
2. EtherCAT junction slaves cannot be used for EtherNet/IP and Ethernet.

Cameras peripheral devices

Type		Model
Cameras peripheral devices	CCTV Lenses	3Z4S-LE Series
External Lightings		FL Series
Lighting Controllers	For FL Series	FL-TCC1

Specifications

Sensors

Item	Type	EtherCAT communication function not provided		EtherCAT communication function provided	
		Color	Monochrome	Color	Monochrome
Model	NPN	FQ-MS120	FQ-MS120-M	FQ-MS120-ECT	FQ-MS120-M-ECT
	PNP	FQ-MS125	FQ-MS125-M	FQ-MS125-ECT	FQ-MS125-M-ECT
Field of vision, Installation distance		Selecting a lens according to the field of vision and installation distance.			
Main functions	Inspection items	Shape search, Search, Labeling, Edge position			
	Number of simultaneous inspections	32			
	Number of registered scenes	32			
Image input	Image processing method	Real color	Monochrome	Real color	Monochrome
	Image elements	1/3-inch color CMOS	1/3-inch monochrome CMOS	1/3-inch color CMOS	1/3-inch monochrome CMOS
	Image filter	High dynamic range (HDR) and white balance	High dynamic range (HDR)	High dynamic range (HDR) and white balance	High dynamic range (HDR)
	Shutter	Electronic shutter; select shutter speeds from 1/10 to 1/30000 (sec)			
	Processing resolution	752 (H) × 480 (V)			
	Pixel size	6.0 (m) × 6.0 (m)			
	Frame rate (image read time)	60 fps (16.7 ms)			
External Lightings	Connecting method	Connection via a strobe light controller			
	Connectable lighting	FL series			
Data logging	Measurement data	In Sensor: Max. 32000 items*1			
	Images	In Sensor: 20 images*1			
Measurement trigger		I/O trigger, Encoder trigger, Communications trigger (Ethernet No-protocol, PLC Link, or EtherCAT)			
I/O specifications	Input signals	9 signals Single measurement input (TRIG) Error clear input (IN0) Encoder counter reset input (IN1) Encoder input (A±, B±, Z±)*2			
	Output signals	5 signals*3 OUT0 Overall judgement output (OR) OUT1 Control output (BUSY) OUT2 Error output (ERROR) OUT3 (Shutter output: SHTOUT) OUT4 (Strobe trigger output: STGOUT)			
	Ethernet specifications	100BASE-TX/10BASE-TX			
	EtherCAT specifications	–		Dedicated protocol for EtherCAT 100BASE-TX	
	Connection method	Special connector cables Power supply and I/O: 1 special connector I/O cable Touch Finder, Computer and Ethernet: 1 Ethernet cable EtherCAT: 2 EtherCAT cable			
LED display		OR: Judgment result indicator ERR: Error indicator BUSY: BUSY indicator ETN: Ethernet communications indicator			
	EtherCAT display	–		L/A IN (Link/Activity IN) × 1 L/A OUT (Link/Activity OUT) × 1 RUN × 1 ERR × 1	
Ratings	Power supply voltage	21.6 to 26.4 VDC (including ripple)			
	Insulation resistance	Between all lead wires and case: 0.5 M (at 250 V)			
	Current consumption	450mA max. (When the FL-series Strobe controller and lighting are used.) 250mA max. (When external lighting is not used.)			
Environmental immunity	Ambient temperature range	Operating: 0 to 50 °C, Storage: -20 to 65 °C (with no icing or condensation)			
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
	Ambient atmosphere	No corrosive gas			
	Vibration resistance (destruction)	10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions, 8 min each, 10 times			
	Shock resistance (destruction)	150 m/s^2 3 times each in 6 direction (up, down, right, left, forward, and backward)			
	Degree of protection	IEC60529 IP40			
Materials		Case: alminium die casting, Rear cover: alminium plate			
Weight		Approx. 390 g (Sensor only)		Approx. 480 g (Sensor only)	
Accessories		Instruction Manual			

*1 If a Touch Finder is used, results can be saved up to the capacity of an SD card.
*2 Encoder input specifications.
*3 The five output signals can be allocated for the judgements of individual inspection items.

Pulse input Specifications (When an open collector type encoder is used.)

Item		Specification		
Input voltage		24 VDC ±10%	12 VDC ±10%	5 VDC ±5%
Input current		4.8 mA (at 24 VDC, typical value)	2.4 mA (at 12 VDC, typical value)	1.0 mA (at 5 VDC, typical value)
NPN	ON voltage*1	4.8 V max.	2.4 V max.	1.0 V max.
	OFF voltage*2	19.2 V min.	9.6 V min.	4.0 V min.
PNP	ON voltage*1	19.2 V min.	9.6 V min.	4.0 V min.
	OFF voltage*2	4.8 V max.	2.4 V max.	1.0 V max.
Maximum response frequency*3		50 kHz (I/O cable: when the FQ-MWD005 or FQ-MWDL005 cables is used.) 20 kHz (I/O cable: when the FQ-MWD010 or FQ-MWDL010 cables is used.)		
Input impedance		5.1 k		

*1 ON voltage: Voltage to change from OFF to ON state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
*2 OFF voltage: Voltage to change from ON to OFF state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
*3 Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

Pulse input Specifications (When a line-driver output type encoder is used.)

Item	Specification
Input voltage	EIA standard RS-422-A line driver level
Input impedance*1	120 ±5%
Differential input voltage	0.2 V min.
Hysteresis voltage	50 mV
Maximum response frequency*2	200 kHz (I/O cable: when the FQ-MWD005, FQ-MWDL005, FQ-MWD010, or FQ-MWDL010 cables is used.)

*1 When terminating resistance function is used.
*2 Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

Touch Finder

Item		Type	Model with DC power supply	Model with AC/DC/battery power supply
Model			FQ-MD30	FQ-MD31
Number of connectable Sensors			2 max.	
Main functions	Types of measurement displays		Last result display, Last NG display, trend monitor, histograms	
	Types of display images		Through, frozen, zoom-in, and zoom-out images	
	Data logging		Measurement results, measured images	
	Menu language		English, Japanese	
Indications	LCD	Display device	3.5-inch TFT color LCD	
		Pixels	320 × 240	
		Display colors	16,777,216	
	Backlight	Life expectancy*1	50,000 hours at 25°C	
		Brightness adjustment	Provided	
		Screen saver	Provided	
	Indicators	Power indicator (color: green)	POWER	
		Error indicator (color: red)	ERROR	
		SD card access indicator (color: yellow)	SD ACCESS	
		Charge indicator (color: orange)	–	CHARGE
Operation interface	Touch screen	Method	Resistance film	
		Life expectancy*2	1,000,000 operations	
External interface	Ethernet		100 BASE-TX/10 BASE-T	
	SD card		Omron SD card (Model: HMC-SD291) or a SDHC card of Class4 or higher rating is recommended.	
Ratings	Power supply voltage	DC power connection	20.4 to 26.4 VDC (including ripple)	
		AC adapter connection	–	100 to 240 VAC, 50/60 Hz
		Battery connection	–	FQ-BAT1 Battery (1 cell, 3.7 V)
	Continuous operation on Battery*3		–	1.5 h
	Current consumption		DC power connection: 0.2 A	
	Insulation resistance		Between all lead wires and case: 0.5 M (at 250 V)	
Environmental immunity	Ambient temperature range		Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)	Operating: 0 to 50°C when mounted to DIN Track or panel 0 to 40°C when operated on a Battery Storage: -25 to 65°C (with no icing or condensation)
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
Environmental immunity	Ambient atmosphere		No corrosive gas	
	Vibration resistance (destruction)		10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions 8 min each, 10 times	
	Shock resistance (destruction)		150 m/s^2 3 times each in 6 direction (up, down, right, left, forward, and backward)	
	Degree of protection		IEC 60529 IP20	
Dimensions			95 × 85 × 33 mm	
Materials			Case: ABS	
Weight			Approx. 270 g (without Battery and hand strap)	
Accessories			Touch Pen (FQ-XT), Instruction Manual	

*1 This is a guideline for the time required for the brightness to diminish to half the initial brightness at room temperature and humidity. No guarantee is implied. The life of the backlight is greatly affected by the ambient temperature and humidity. It will be shorter at lower or higher temperatures.
*2 This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions.
*3 This value is only a guideline. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

Battery Specifications

Item Model	FQ-BAT1
Battery type	Secondary lithium ion battery
Nominal capacity	1800 mAh
Rated voltage	3.7 V
Dimensions	35.3 × 53.1 × 11.4 mm
Ambient temperature range	Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)
Charging method	Charged in Touch Finder (FQ-MD31). AC adapter (FQ-AC□) is required.
Charging time*1	2.0 h
Battery backup life*2	300 charging cycles
Weight	50 g max.

*1 This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions.
*2 This is a guideline for the time required for the capacity of the Battery to be reduced to 60% of the initial capacity. No guarantee is implied.The value will be affected by the operating environment and operating conditions.

Sysmac Studio

Item	Requirement
Operating system (OS)*1, *2 Japanese or English system	Windows XP (Service Pack 3 or higher, 32-bit version) /Vista (32-bit version) / 7 (32-bit/64-bit version)
CPU	Windows computers with Celeron 540 (1.8 GHz) or faster CPU. Core i5 M520 (2.4 GHz) or equivalent or faster recommended
Main memory	2GB min.
Hard disk	At least 1.6 GB of available space*3
Display	XGA 1024 × 768, 1600 million colors. WXGA 1280 × 800 min. recommended
Disk drive	DVD-ROM drive
Communications ports	USB port corresponded to USB 2.0, or Ethernet port

*1 Sysmac Studio Operating System Precaution:
System requirements and hard disk space may vary with the system environment.
*2 The following restrictions apply when Sysmac Studio is used with Microsoft Windows Vista or Windows 7.
Some Help files cannot be accessed.
The Help files can be accessed if the Help program distributed by Microsoft for Windows (WinHlp32.exe) is installed. Refer to the Microsoft homepage listed below or contact Microsoft for details on installing the file. (The download page is automatically displayed if the Help files are opened while the user is connected to the Internet.)
http://support.microsoft.com/kb/917607/en-us
*3 To use the file logging function, additional memory area to save the logging data is necessary.

FQ-M Series EtherCAT Communications Specifications

Item	Specifications
Communications standard	IEC 61158 Type12
Physical layer	100BASE-TX (IEEE802.3)
Connector	M12 × 2 E-CAT IN: EtherCAT (IN) E-CAT OUT: EtherCAT (OUT)
Communications media	Use the cables for FQ-MWN□□, or FQ-WN□□ series.
Communications distance	Use the communication cable within the length of FQ-MWN□□ or FQ-WN□□ series cables.
Process data	Variable PDO Mapping
Mailbox (CoE)	Emergency messages, SDO requests, SDO responses, and SDO information
Distributed clock	Synchronization with DC mode 1
LED display	L/A IN (Link/Activity IN) × 1, L/A OUT (Link/Activity OUT) × 1, RUN × 1, ERR × 1

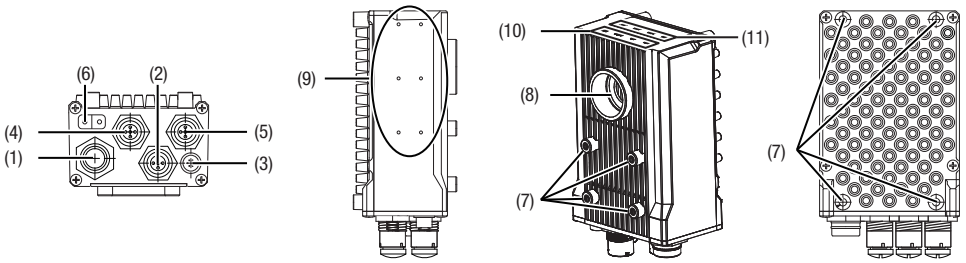
Version Information

FQ-M Series and Programming Devices

FQ-M Series	Required Programming Device	
	Sysmac Studio Standard Edition/Vision Edition	
	Ver.1.00	Ver.1.01 or higher
FQ-MS□□□(-M) FQ-MS□□□(-M)-ECT	Not supported	Supported

Components and Functions

Sensor

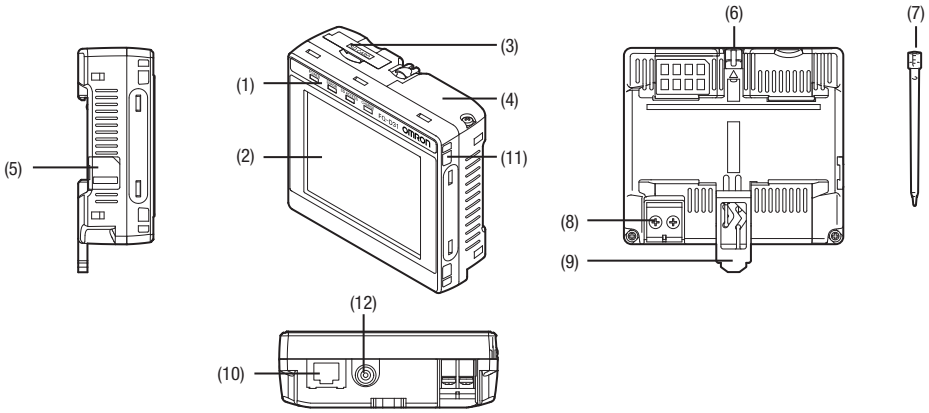


No.	Name	Description
(1)	I/O Cable connector	An I/O Cable is used to connect the Sensor to the power supply and external I/O.
(2)	Ethernet connector	An Ethernet cable is used to connect the Sensor to external devices such as PLCs, the Touch Finder, or computers.
(3)	Lighting connector	Connect an external lighting (strobe controller).
(4)	EtherCAT connector (IN)*1	Connect an EtherCAT compatible device.
(5)	EtherCAT connector (OUT)*1	Connect an EtherCAT compatible device.
(6)	Node address switch*1	Set the node address for EtherCAT communications.
(7)	Installation holes	Holes to install and secure the camera.
(8)	C-mount lens connection part	Install the C-mount lens in this part. Determine the field of view depending on the measurement target and select a suitable CCTV lens (C-mounting lens).

No.	Name		Description
(9)	Strobe controller connection holes		Install the strobe controller in this part. FL-TCC1 can be mounted.
(10)	Measurement process Operation indicators	OR	Lit in orange while OR signal is ON.
		ETN	Lit in orange while in Ethernet communications.
		ERROR	Lit in red when an error occurs.
		BUSY	Lit in green while the sensor is processing.
(11)	EtherCAT Operation indicators	L/A IN	Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data IN).
		L/A OUT	Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data OUT).
		ECAT RUN	Lit in green when EtherCAT communication is available.
		ECAT ERROR	Lit in red when an EtherCAT communications error occurs.

*1 FQ-MS□□□-ECT and FQ-MS□□□-M-ECT only.

Touch Finder



No.	Name		Description
(1)	Operation indicators	POWER	Lights green when the Touch Finder is turned ON.
		ERROR	Lights red when an error occurs.
		SD ACCESS	Lights yellow when an SD card is inserted. Flashes yellow when the SD card is being accessed.
		CHARGE*1	Lights orange when the Battery is charging.
(2)	LCD/touch panel		Displays the setting menu, measurement results, and images input by the camera.
(3)	SD card slot		An SD card can be inserted.
(4)	Battery cover*		The Battery is inserted behind this cover. Remove the cover when mounting or removing the Battery.
(5)	Power supply switch		The Battery is inserted behind this cover. Remove the cover when mounting or removing the Battery.

*1 Applicable to the FQ-MD31 only.

No.	Name	Description
(6)	Touch pen holder	The touch pen can be stored here when it is not being used.
(7)	Touch pen	Used to operate the touch panel.
(8)	DC power supply connector	Used to connect a DC power supply.
(9)	Slider	Used to mount the Touch Finder to a DIN Track.
(10)	Ethernet port	Used when connecting the Touch Finder to the Sensor with an Ethernet cable. Insert the connector until it locks in place.
(11)	Strap holder	This is a holder for attaching the strap.
(12)	AC power supply connector*1	Used to connect the AC adapter.

*1 Applicable to the FQ-MD31 only.

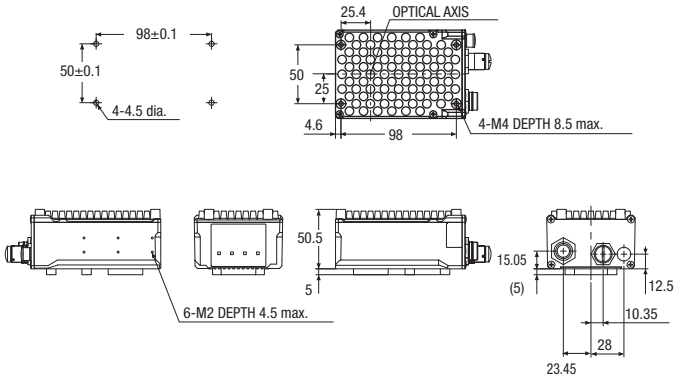
Dimensions

(Unit: mm)

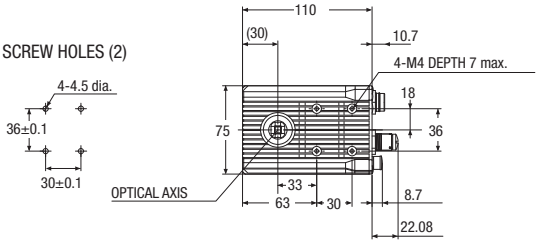
Sensor

FQ-MS120/MS120-M
FQ-MS125/MS125-M

MOUNTING SCREW HOLES (1)

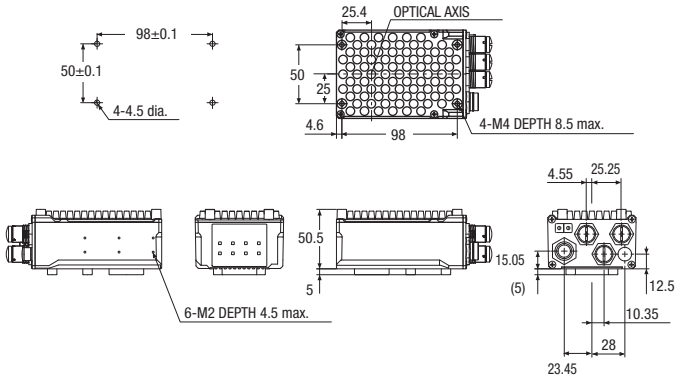


MOUNTING SCREW HOLES (2)

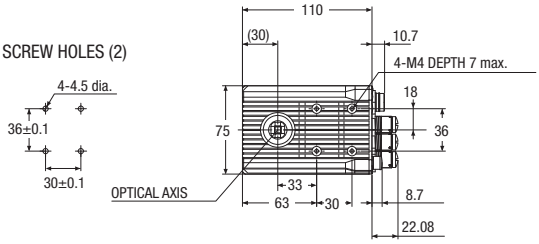


FQ-MS120-ECT/MS120-M-ECT
FQ-MS125-ECT/MS125-M-ECT

MOUNTING SCREW HOLES (1)

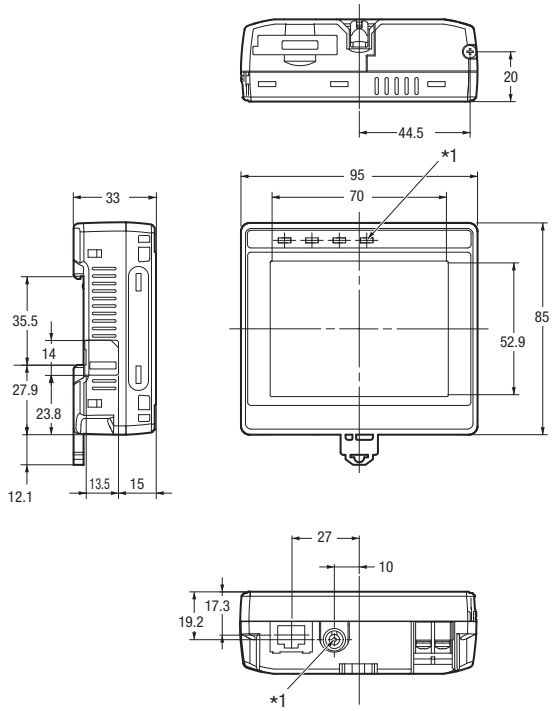


MOUNTING SCREW HOLES (2)

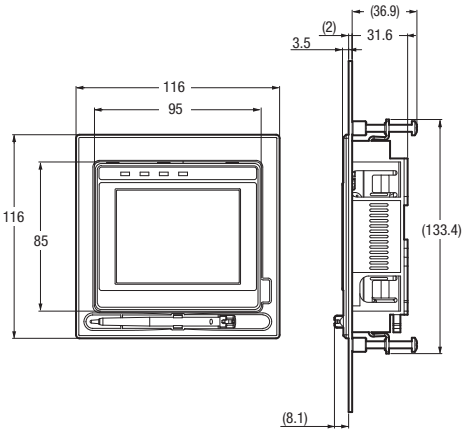


Touch Finder

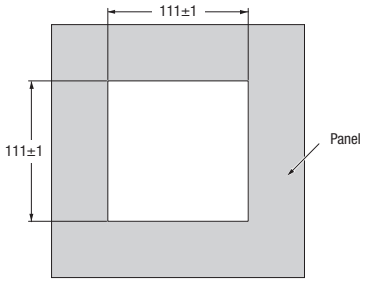
FQ-MD30/MD31



Panel Mounting Adapter*2



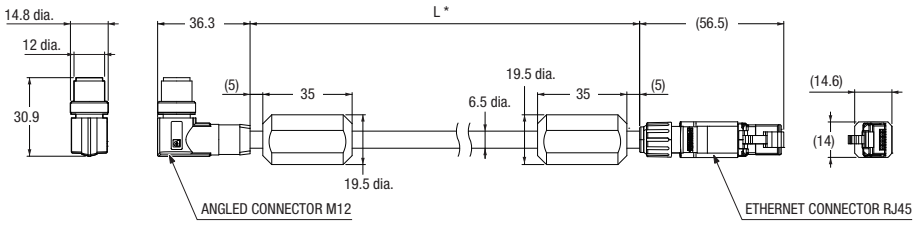
Panel Cutout Dimensions



*1 Provided with FQ-MD31 only.
*2 The dimension of the panel mounting adapter does not include that of a FQ-MD□□.

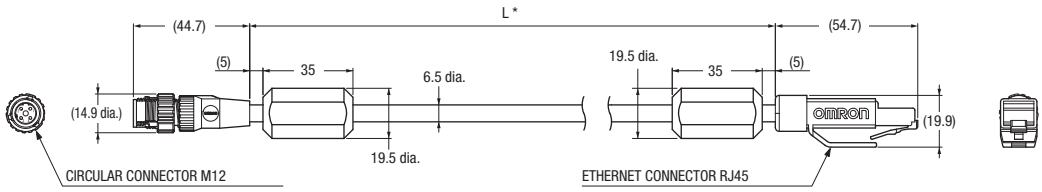
Cables

● **For EtherCAT and Ethernet cable**
Angle:M12/ Straight:RJ45
FQ-MWNL005/010



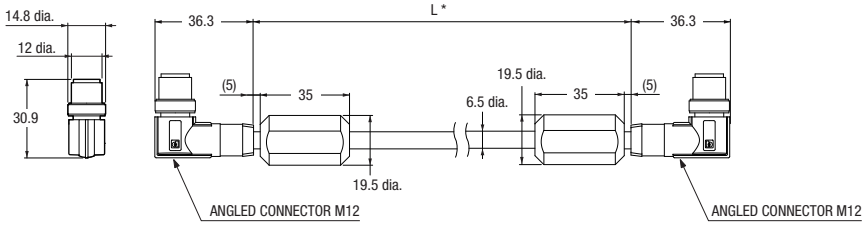
* Cable is available in 5 m/10 m.

Straight type (M12/RJ45)
FQ-WN005/010-E



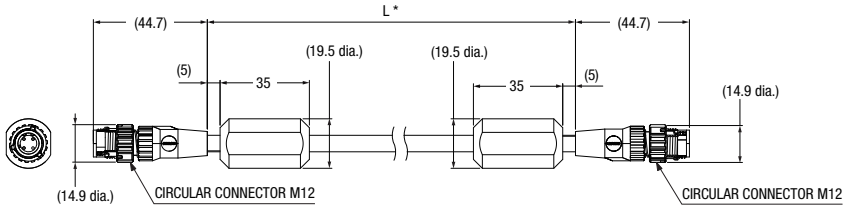
* Cable is available in 5 m/10 m.

● **For EtherCAT cable**
Angle type (M12/M12)
FQ-MWNEL005/010



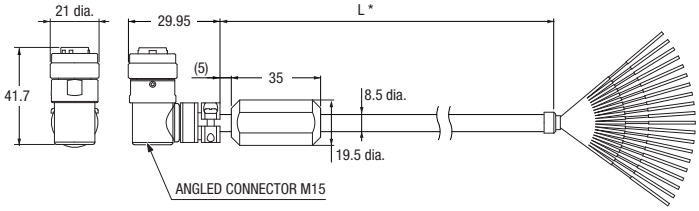
* Cable is available in 5 m/10 m.

Straight type (M12/M12)
FQ-MWNE005/010



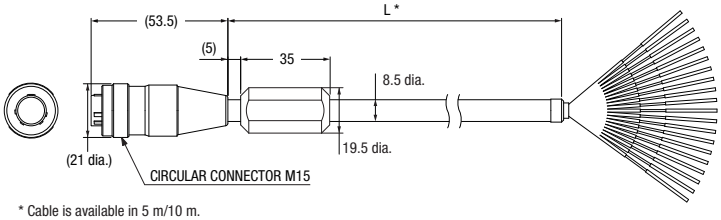
* Cable is available in 5 m/10 m.

● **I/O Cables**
Angle type
FQ-MWDL005/010



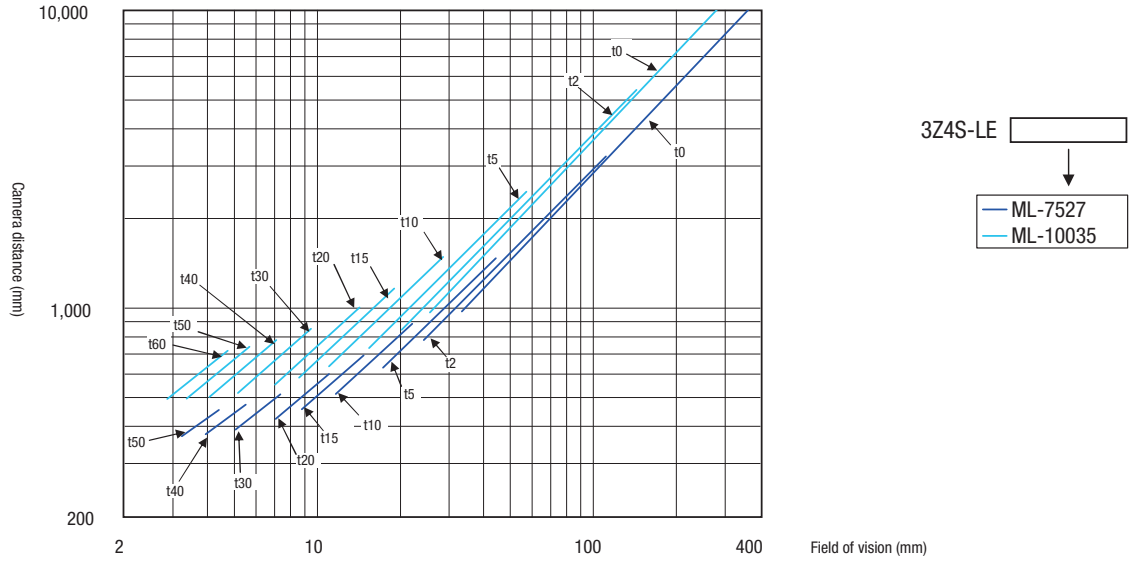
* Cable is available in 5 m/10 m.

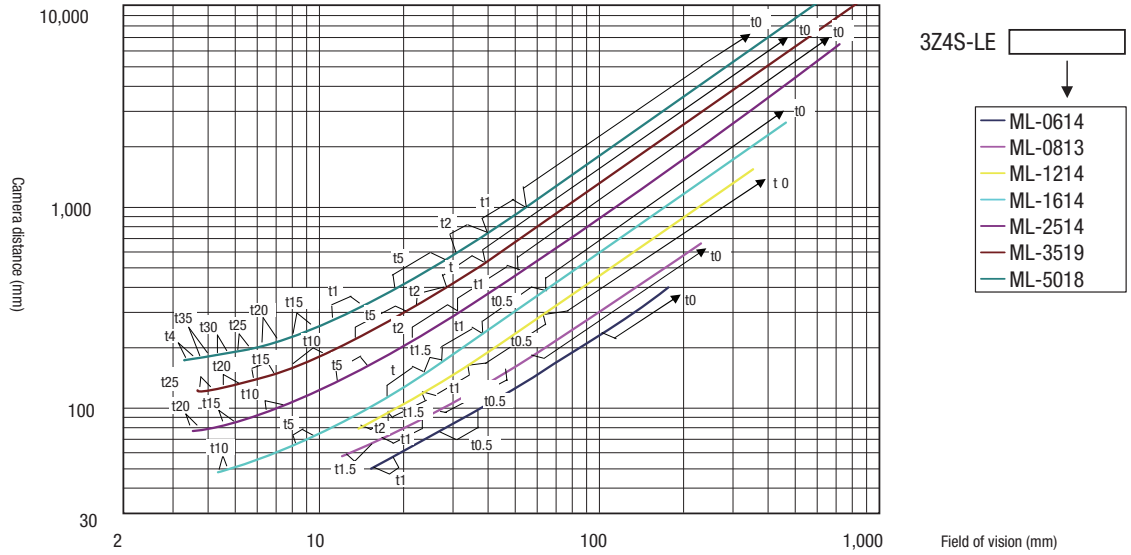
Straight type
FQ-MWD005/010



* Cable is available in 5 m/10 m.

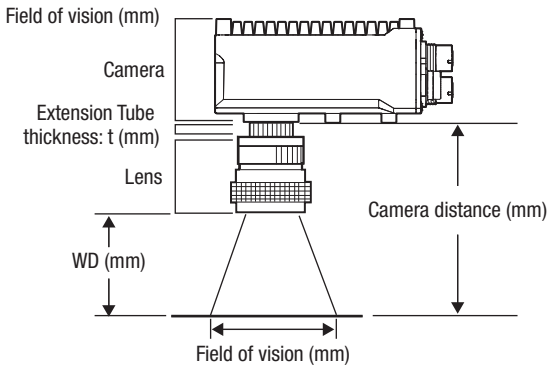
Optical Chart

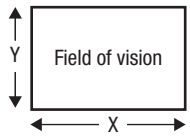




Meaning of Optical Chart

The X axis of the optical chart shows the field of vision (mm) *1, and the Y axis of the optical chart shows the camera installation distance (mm).*2





*1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
*2. The vertical axis represents WD for small cameras.

Related Manuals

Cat. No.	Model number	Manual
Z314	FQ-MS□□□(-M) FQ-MS□□□(-M)-ECT	Specialized Vision Sensor for Positioning FQ-M-Series User's Manual
W504	SYSMAC-□□□□□□	Sysmac Studio OPERATION MANUAL

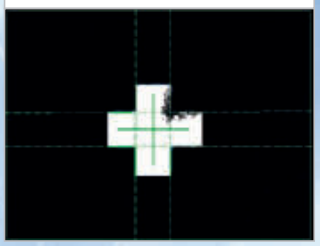
FZM1 VISION SYSTEM

Tailored for pick & place

The Omron Vision Sensor FZM1 is optimized to detect in high speed and high accuracy the position and orientation of any object.
New generation image processing technologies and an intuitive user interface optimized for positioning applications. High speed communication via EtherCAT or UDP enables an easy interworking with motion components from Omron and other vendors.

Positioning with Alignment Mark

EC Cross



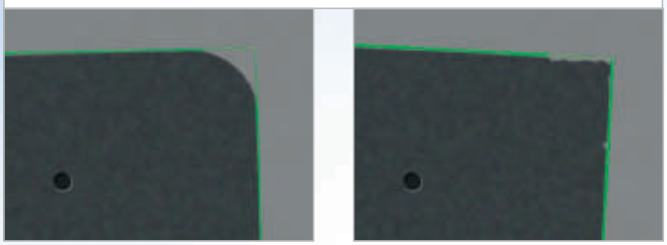
Dirty

EC Circle

Overlapping

Positioning with Corner Detection

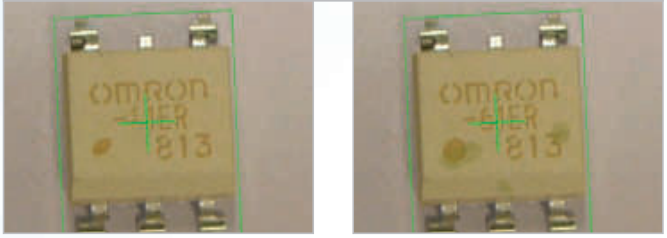
EC Corner



Rounded or Broken Corner

Positioning by Shape of object

ECM Search

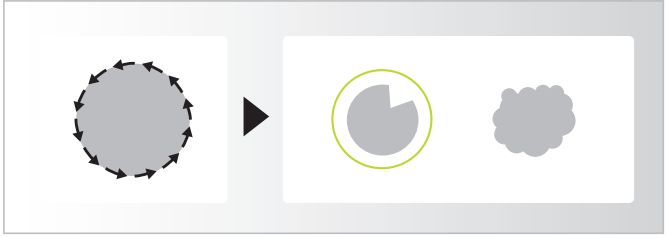


Printing Mistake

Dirt

EC Image Processing

EC Edge Code

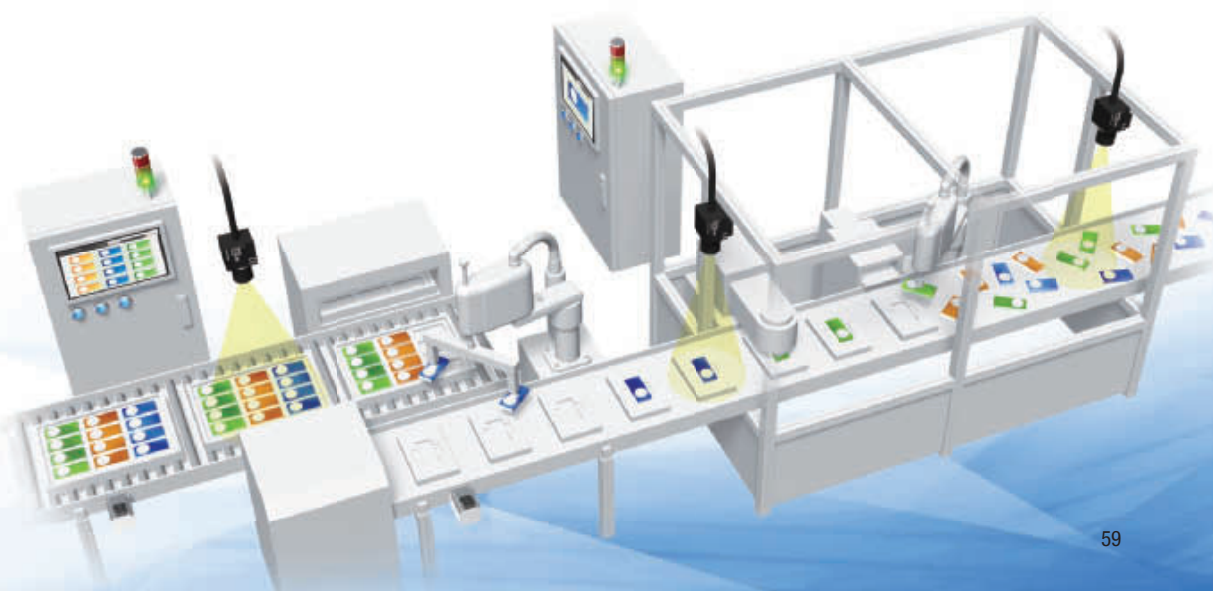


With EC image processing, the measurement object is recognized as a geometric shape to minimize offsets in the detection position caused by light interference or dirt. This achieves stable, accurate position detection.

EtherCAT®

YOUR BENEFITS

- Stable measurements under changing conditions: difference of the work piece, dust and dirt, and changing ambient environment
- Shape based option positioning: separation of attached objects, detection of partially hidden objects, compensation of rounded or broken edges
- Alignment and quality inspection in one system: inspection of scratches and defects, detection of dirty or overlapping objects, edge and corner breakage inspection, and automatic calibration for robots, XY and UVW stages
- Flexible camera installation: use different fields of vision and install at any angle



FZM1 Vision system

The Omron Vision Sensor FZM1 is optimized to detect in high speed and high accuracy the position and orientation of any object. New generation image processing technologies and an intuitive user interface optimized for positioning applications. High speed communication via EtherCAT or UDP enables an easy interworking with motion components from Omron and other vendors.

Tailored for pick & place

- Alignment and quality inspection in one system
- High speed and precise positioning
- Connectivity with EtherCAT/Ethernet
- Shape based object positioning
- Stable measurements under changing conditions
- Automatic calibration for robots
- Flexible camera installation

Ordering Information

Item		Descriptions			Remarks		Order code
Controllers	Standard Controllers with EtherCAT interfase	Box-type Controllers	Two-camera controllers	NPN	---		FZM1-350-ECT
				PNP			FZM1-355-ECT
Cameras	High-speed Cameras	300,000 Pixels	Monochrome		Lens required		FZ-SH
			Color				FZ-SHC
	Digital cameras	300,000 Pixels	Monochrome				FZ-S
			Color				FZ-SC
		2 million pixels	Monochrome				FZ-S2M
			Color				FZ-SC2M
	Small digital cameras	300,000-pixel flat type	Monochrome		CCTV lens required		FZ-SF
			Color				FZ-SFC
		300,000-pixel pen type	Monochrome				FZ-SP
			Color				FZ-SPC
	Intelligent cameras	Wide field of vision	Color		Camera + Zoom, Autofocus Lens + Intelligent Lighting		FZ-SLC100
		Narrow field of vision					FZ-SLC15
	Autofocus cameras	Wide field of vision			Camera + Zoom, Autofocus Lens		FZ-SZC100
		Narrow field of vision					FZ-SZC15
Cameras peripheral devices	Intelligent camera diffusion plate	Wide field of vision			---		FZ-SLC100-DL
		Narrow field of vision					FZ-SLC15-DL
	CCTV Lenses				---		3Z4S-LE Series
	Extension Tubes				---		
	Low-distortion Lenses				Low distortion lens for 2-million pixel cameras		FZ-LEH5/LEH8/LEH12/LEH16/LEH25/LEH35/LEH50/LEH75/LEH100
	Lenses for small camera				Lens for 300,000-pixel small cameras		FZ-LES3/LES6/LES16/LES30
	Extension Tubes for small camera				Extension Tubes for 300,000-pixel small cameras		FZ-LESR
Cables	Camera Cable				Cable length: 2 m, 5 m, or 10 m*1		FZ-VS
	Bend resistant Camera Cables				Cable length: 2 m, 5 m, or 10 m*2		FZ-VSB
	Right-angle Camera Cable*3				Cable length: 2 m, 5 m, or 10 m*1		FZ-VSL
	Long-distance camera cable				Cable length: 15 m*4		FZ-VS2
	Long-distance right-angle camera cable				Cable length: 15 m*4		FZ-VSL2
	Cable extension unit				Up to two Extension Units and three Cables can be connected. (Maximum cable length: 45 m*5)		FZ-VSJ
	Monitor cable				Cable length: 2 m or 5 m		FZ-VM
	Parallel cable				Cable length: 2 m or 5 m		FZ-VP
					Cable length: 2 m or 5 m, Connector type		FZ-VPX*6
Peripheral devices	LCD monitor				For Box-type Controllers		FZ-M08
	USB memory	1GB			Capacity: 1 GB		FZ-MEM1G
Mouse					Recommended Products (Optical Mouse) Microsoft Corporation: Compact Optical Mouse, U81 Series		---
External Lightings					---		3Z4S-LT Series
							FZ-LT Series
Strobe Controllers		For 3Z4S-LT Series			Required to control external lighting from a Controller	One channel	Manufactured by MORITEX Corporation 3Z4S-LT MLEK-C100E1TS2
		For FZ-LT Series					FZ-LTA100
						Two channels	FZ-LTA200

*1 The 10-m cable cannot be used for the intelligent camera, autofocus camera and 5 million-pixel camera.
*2 The 10-m cable cannot be used for the intelligent camera, autofocus camera 2 million-pixel camera and 5 million-pixel camera.
*3 This Cable has an L-shaped connector on the Camera end.
*4 The 15-m cable cannot be used for the intelligent camera, autofocus camera and 5 million-pixel camera.
*5 The maximum cable length depends on the Camera being connected, and the model and length of the Cable being used. For further information, please refer to the "Cameras /Cables" table in Page 17.
*6 Scheduled for release soon. Connector-Terminal Block Conversion Units can be connected (Recommended Products: OMRON XW2B-50G4/50G5, XE2D-50G6)

FZ3-UAL Positioning Software for FZ3-series Vision Sensors

The FZ3-UAL Positioning Software (sold separately) can be used to install FZM1-series positioning menus and processing items in FZ3-series Controllers. Although EtherCAT communications is not supported, all other FZM1-series functions can be used. Ask your OMRON representative for details.

High-resolution, Low-distortion Lenses

Lens model	FZ-LEH5	FZ-LEH8	FZ-LEH12	FZ-LEH16	FZ-LEH25	FZ-LEH35	FZ-LEH50	FZ-LEH75	FZ-LEH100
Appearance									
Focal length	5 mm	8 mm	12.5 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
Brightness	F2.8	F1.4	F1.4	F1.4	F1.4	F2	F2.8	F2.5	F2.8
Filter size	M40.5 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M34.0 P0.5	M40.5 P0.5

CCTV Lenses

Lens model	3Z4S-LE ML-0614	3Z4S-LE ML-0813	3Z4S-LE ML-1214	3Z4S-LE ML-1614	3Z4S-LE ML-2514	3Z4S-LE ML-3519	3Z4S-LE ML-5018	3Z4S-LE ML-7527	3Z4S-LE ML-10035
Appearance									
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
Brightness	F1.4	F1.3	F1.4	F1.4	F1.4	F1.9	F1.8	F2.7	F3.5
Filter size	M27 P0.5	M25.5 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M30.5 P0.5	M30.5 P0.5	M30.5 P0.5

Lenses for small camera

Lens model	FZ-LES3	FZ-LES6	FZ-LES16	FZ-LES30
Appearance				
Focal length	3 mm	6 mm	16 mm	30 mm
Brightness	F2.0	F2.0	F3.4	F3.4

Extension Tubes

Model	3Z4S-LE-ML-EXR
Contents	Set of 7 tubes (40 mm, 20 mm, 10 mm, 5 mm, 2.0 mm, 1.0 mm, and 0.5 mm) Maximum outer diameter: 30 mm dia.

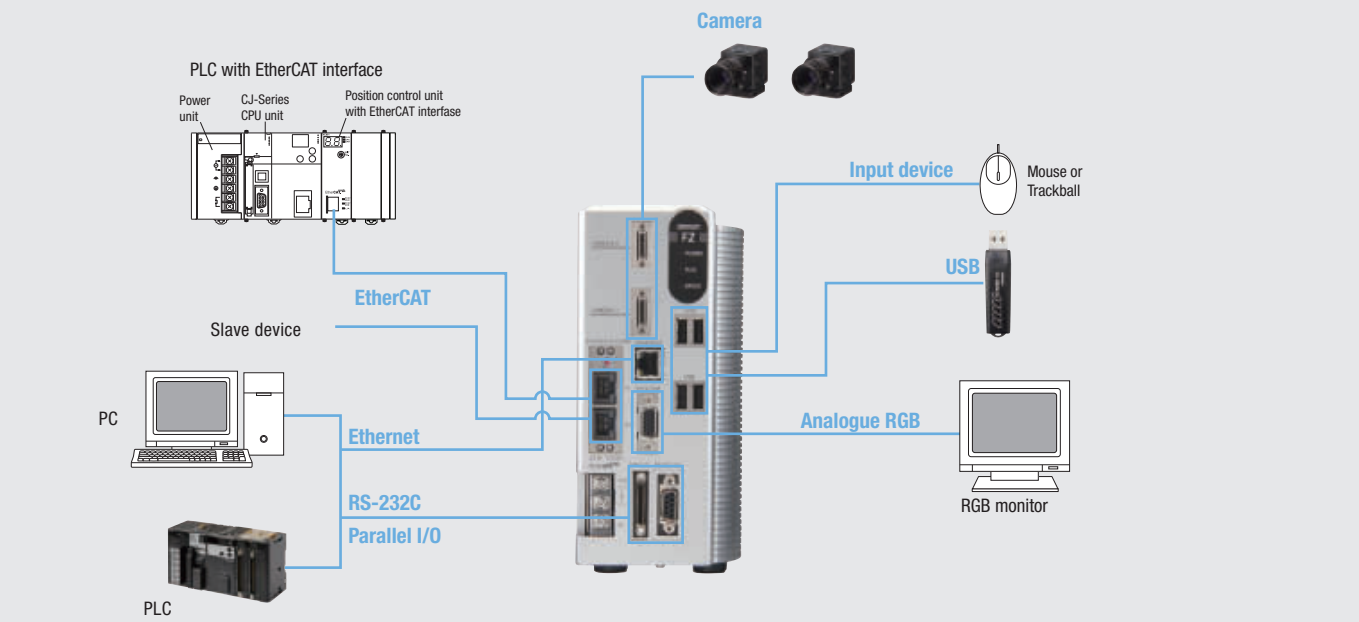
Extension Tubes for small camera

Model	FZ-LESR
Contents	Set of 3 tubes (15 mm, 10 mm, 5 mm) Maximum outer diameter: 12 mm dia.

Precautions

- Do not use the 0.5-mm, 1.0-mm, and 2.0-mm Extension Tubes attached to each other. Since these Extension Tubes are placed over the threaded section of the Lens or other Extension Tube, the connection may loosen when more than one 0.5-mm, 1.0-mm or 2.0-mm Extension Tube are used together.
- Reinforcement may be required for combinations of Extension Tubes exceeding 30 mm if the Camera is subject to vibration.

System configuration



Ratings and Specifications

Standard Controllers with EtherCAT interface

Model	NPN Output		FZM1-350-ECT
	PNP Output		FZM1-355-ECT
Connected Camera			High-speed Cameras, Digital cameras, Small digital cameras, Intelligent camera, or Autofocus cameras
No. of Cameras			2
Processing resolution	When connected to a 300,000-pixel camera		640 (H) × 480 (V)
	When connected to a 2 million-pixel camera		1600 (H) × 1200 (V)
No. of scenes			32
Number of logged images*1	When connected to a 300,000-pixel camera	Connected to 1 camera	Color camera: 250, Monochrome Camera: 252
		Connected to 2 cameras	Color camera: 125, Monochrome Camera: 126
	When connected to a 2 million-pixel camera	Connected to 1 camera	Color camera: 40, Monochrome Camera: 40
		Connected to 2 cameras	Color camera: 20, Monochrome Camera: 20
Operation			Mouse or similar device
Settings			Create series of processing steps by editing the flowchart (Help messages provided).
Serial communications			RS-232C/422A: 1CH
Network communications			Ethernet 100BASE-TX/10BASE-T
EtherCAT communications			Protocol only for EtherCAT communication 100BASE-TX
Parallel I/O			13 input (RESET, ENCTRG_A, ENCTRG_B, STEP/ENCTRG_Z, DSA, and DI0 to 7) 24 output (RUN, BUSY, GATE, OR, READY, ERROR, STGPUT0 to 1, and DO0 to 15)
Monitor interface			Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots)
USB interface			4 channels (supports USB 1.1 and 2.0)
Power supply voltage			20.4 to 26.4 VDC
Current consumption*2	When connected to a intelligent or autofocus camera		5 A max.
	When connected to a 300,000-pixel camera		3.7 A max.
	When connected to a 2 million-pixel camera		
Ambient temperature range			Operating: 0 to 45°C, 0 to 50°C*3, Storage: -20 to 65 °C (with no icing or condensation)
Ambient humidity range			Operating and storage: 35% to 85% (with no condensation)
Weight			Approx. 1.9 kg
Accessories			Please Read First, Instruction manual (Setup)

*1 The number of logged images will vary when connecting multiple Cameras with different models.
*2 When the strobe controller is connected to the lights, the controller uses power as much as it does when connected to the intelligent camera.
*3 The operating mode can be switched from the Controller Menu settings.

High-speed Cameras

Model	FZ-SH	FZ-SHC
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements	
Color/Monochrome	Monochrome	Color
Effective pixels	640 (H) × 480 (V)	
Pixel size	7.4 (μm) × 7.4 (μm)	
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s	
Partial function	12 to 480 lines	
Frame rate (image read time)	204 fps (4.9ms)	
Field of vision	Selecting a lens according to the field of vision and installation distance	
Installation distance		
Ambient temperature range	Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)	
Weight	Approx. 105 g	
Accessories	Instruction manual	

Intelligent cameras, autofocus cameras

Model	FZ-SLC100	FZ-SLC15	FZ-SZC100	FZ-SZC15
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements			
Color/Monochrome	Color			
Effective pixels	640 (H) × 480 (V)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s			
Partial function	12 to 480 lines			
Frame rate (image read time)	80 fps (12.5 ms)			
Field of vision*1	13 to 100 mm*2	2.9 to 14.9 mm*2	13 to 100 mm*2	2.9 to 14.9 mm*2
Installation distance	70 to 190 mm*2	35 to 55 mm*2	77.5 to 197.5 mm*2	47.5 to 67.5 mm
LED class*3 (lighting)	Class 2		---	
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
Weight	Approx. 670 g	Approx. 700 g	Approx. 500 g	
Accessories	Instruction manual and hexagonal wrench			

*1 The length of the visual field is the lengths along the Y axis.
*2 Tolerance: ±5% max.
*3 Applicable standards: IEC 60825-1: 1993 + A1: 1997 + A2-2001, EN 60825-1: 1994 + A1: 2002 + A2: 2001

Digital cameras

Model	FZ-S	FZ-SC	FZ-S2M	FZ-SC2M
Image elements	Interline transfer reading all pixels			
	1/3-inch CCD image elements		1/1.8-inch CCD image elements	
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)		1600 (H) × 1200 (V)	
Pixel size	7.4 (μm) × 7.4 (μm)		4.4 (μm) × 4.4 (μm)	
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s			
Partial function	12 to 480 lines		12 to 1200 lines	
Frame rate (image read time)	80 fps (12.5 ms)		30 fps (33.3 ms)	
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance			
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
Weight	Approx.55 g		Approx. 76 g	
Accessories	Instruction manual			

Small digital cameras

Model	FZ-SF	FZ-SFC	FZ-SP	FZ-SPC
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements			
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	640(H) × 480(V)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s			
Partial function	12 to 480 lines			
Frame rate (image read time)	80 fps (12.5 ms)			
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance			
Ambient temperature range	Operating: 0 to 50°C (camera amp) 0 to 45°C (camera head) Storage: -25 to 65°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
Weight	Approx.150 g			
Accessories	Instruction manual, installation bracket, Four mounting brackets (M2)		Instruction manual	

LCD Monitor

Model	FZ-M08
Size	8.4 inches
Type	Liquid crystal color TFT
Resolution	1,024 × 768 dots
Input signal	Analog RGB video input, 1 channel
Power supply voltage	21.6 to 26.4 VDC
Current consumption	Approx. 0.7 A max.
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)
Weight	Approx. 1.2 kg
Accessories	Instruction manual and Four mounting brackets

Cable Extension Unit

Model	FZ-VSJ
Power supply voltage*1	11.5 to 13.5 VDC
Current consumption*2	1.5 A max.
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)
Maximum Units connectable	2 Units per Camera
Weight	Approx. 240 g
Accessories	Instruction manual and 4 mounting screws

*1 A power supply must be connected to the Strobe Controller and Camera when connecting a FZ-SLC100/SLC15/SZC100/SZC15 and using a Strobe Controller (3Z4S-LT MLEK-C100E1TS2.)
*2 The current consumption is when every Camera and Strobe Controller is connected to a power supply.

Camera Cables

Model	FZ-VS (2 m)	FZ-VSB (2 m)	FZ-VSL (2 m)
Shock resistiveness (durability)	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times		
Ambient temperature range	Operation and storage: 0 to 65°C (with no icing or condensation)		
Ambient humidity range	Operation and storage: 40% to 70% (with no condensation)		
Ambient atmosphere	No corrosive gases		
Material	Cable sheath, connector: PVC		
Minimum bending radius	69 mm	81 mm	69 mm
Weight	approx. 170g	approx. 220g	approx. 170g

Long-distance Camera Cables

Model	FZ-VS2 (15 m)	FZ-VSL2 (15 m)
Shock resistiveness (durability)	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation and storage: 0 to 65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 40% to 70% (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath, connector: PVC	
Minimum bending radius	93 mm	
Weight	approx. 1600g	

Monitor Cable

Model	FZ-VM
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times
Ambient temperature range	Operation: 0 to 50°C Storage: -20 to 65°C (with no icing or condensation)
Ambient humidity range	Operation and storage: 35% to 85% (with no condensation)
Ambient atmosphere	No corrosive gases
Material	Cable sheath: heat-resistant PVC Connector: PVC
Minimum bending radius	75 mm
Weight	approx. 170g

Parallel Cable

Model	FZ-VP	FZ-VPX
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation: 0 to 50°C Storage: -20 to 65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 35% to 85% (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath: heat-resistant PVC Connector: resin	
Minimum bending radius	75 mm	
Weight	approx. 160g	approx. 180g

Connection Table

Cameras /Cables Connection Table

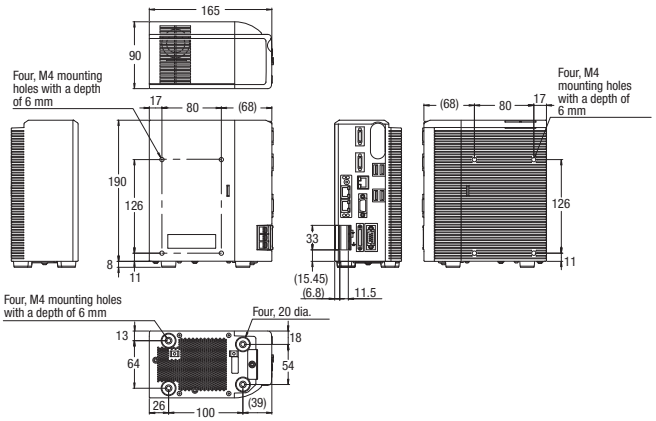
Type of camera	Cable length	Intelligent cameras Autofocus cameras	High-speed cameras	Digital cameras		Small digital cameras	Order code
				300,000-pixel	2 million-pixel	Pen type / flat type	
Camera Cables Right-angle camera cables	2 m	■	■	■	■	■	FZ-VS FZ-VSL
	5 m	■	■	■	■	■	
	10 m	–	■	■	■	■	
Bend resistant camera cables	2 m	■	■	■	■	■	FZ-VSB
	5 m	■	■	■	■	■	
	10 m	–	■	■	–	■	
Long-distance camera cable Long-distance right-angle camera cable	15 m	–	■	■	■	■	FZ-VS2 FZ-VSL2

Dimensions

(Unit: mm)

Controllers

FZM1-35□-ECT

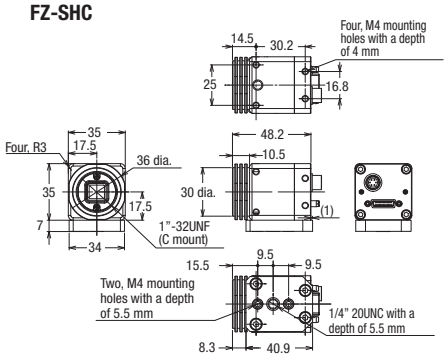


Cameras

■ **High-speed Cameras**

FZ-SH

FZ-SHC

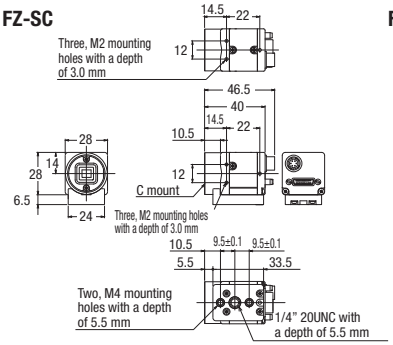


■ **Digital cameras**

300,000-pixel camera

FZ-S

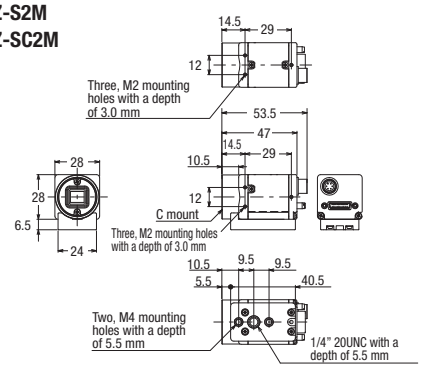
FZ-SC



2 million-pixel camera

FZ-S2M

FZ-SC2M



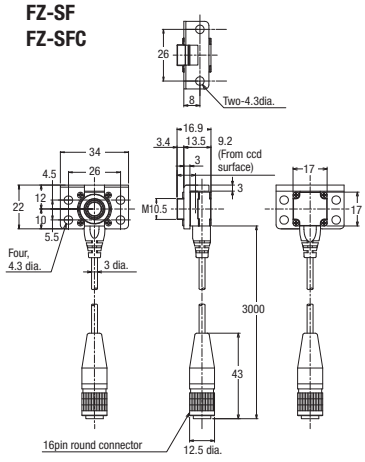
■ **Small digital cameras**

Camera head

Flat camera

FZ-SF

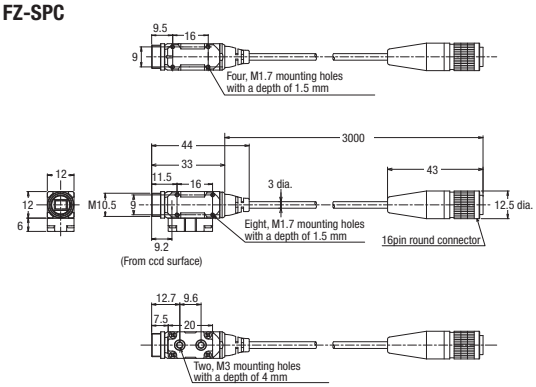
FZ-SFC



Pen-shaped camera

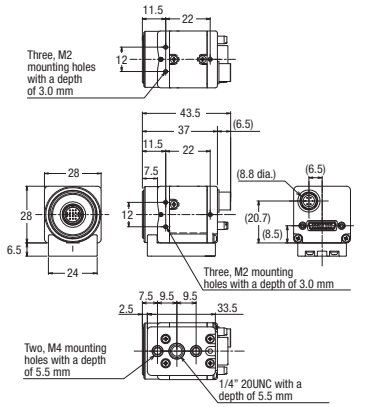
FZ-SP

FZ-SPC



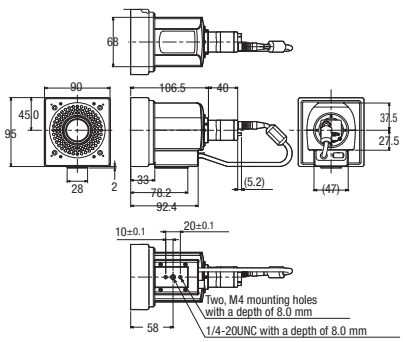
Camera amplifier

Can be used for both flat cameras and pen-shaped cameras

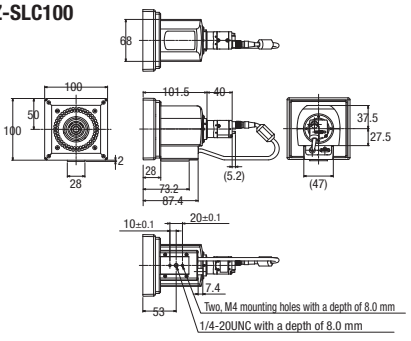


■ **Intelligent camera**

FZ-SLC15



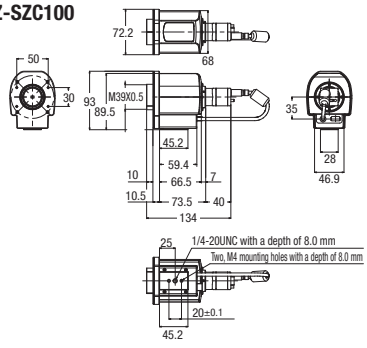
FZ-SLC100



■ **Auto focus camera**

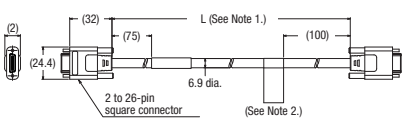
FZ-SZC15

FZ-SZC100

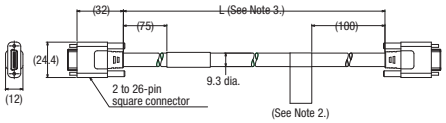


Cable

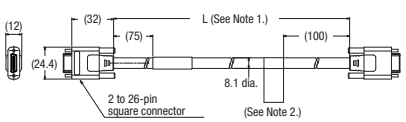
■ Camera Cable
Camera Cable
FZ-VS



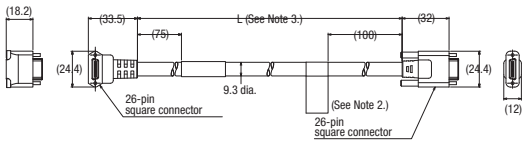
Long-distance Camera Cable
FZ-VS2



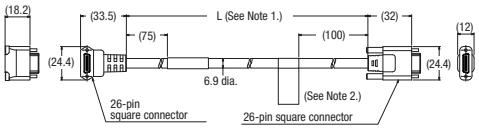
Bend resistant Cable
FZ-VSB



Long-distance Right-angle Camera Cable
FZ-VSL2

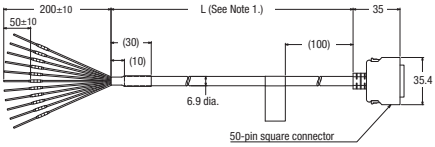


Right-angle Camera Cable
FZ-VSL



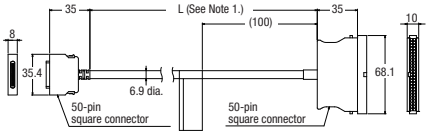
Note: 1. Cable is available in 2 m/5 m/10 m.
2. Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.
3. Cable is available in 15 m.

Parallel Cable
FZ-VP



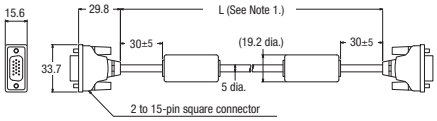
Note: 1. Cable is available in 2 m/5 m.

FZ-VPX



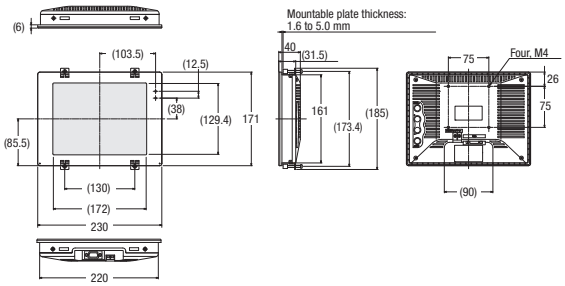
Note: 1. Cable is available in 2 m/5 m.

Monitor Cable
FZ-VM

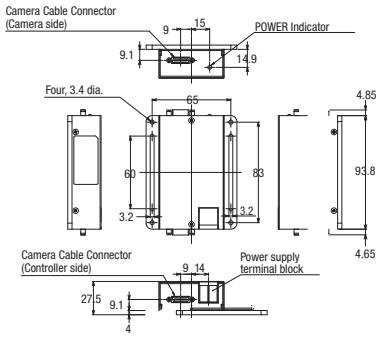


Note: 1. Cable is available in 2 m/5 m.

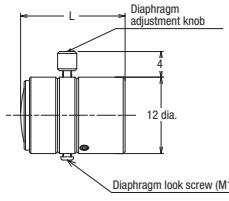
LCD Monitor
FZ-M08



Camera Cable Extension Unit
FZ-VSJ

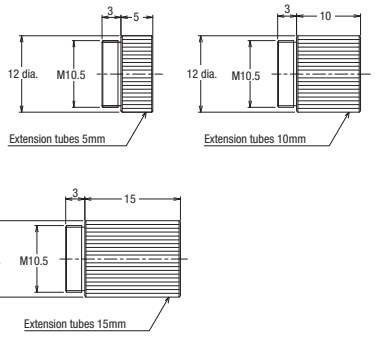


Lens for small camera
FZ-LES Series



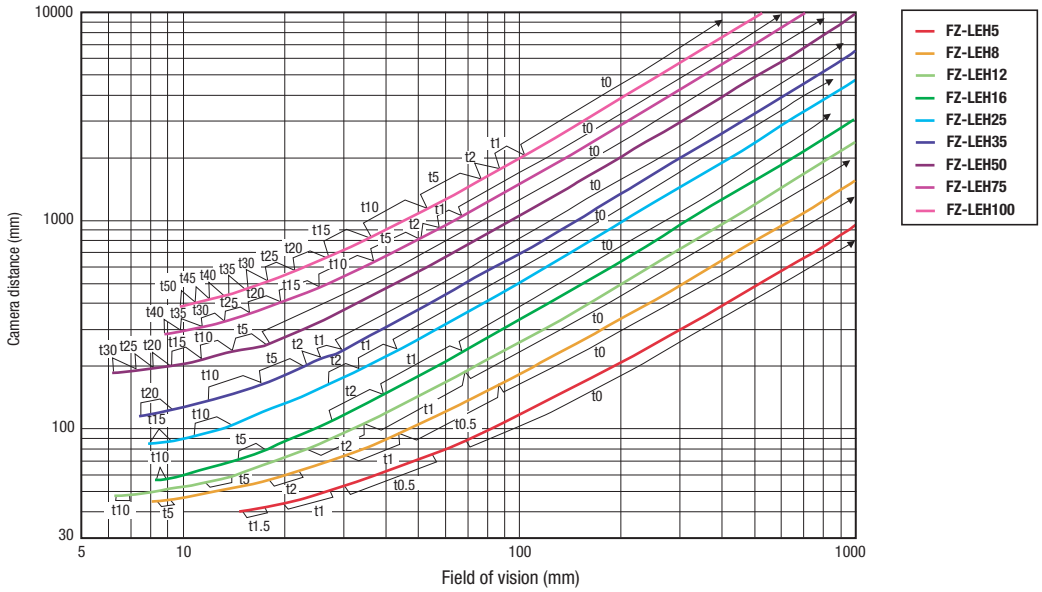
Lenses Model	Focal length	Brightness	Maximum outside diameter	Overall length
FZ-LES3	3 mm	F2.0	12 dia.	16.4 mm
FZ-LES6	6 mm	F2.0	12 dia.	19.7 mm
FZ-LES16	16 mm	F3.4	12 dia.	23.1 mm
FZ-LES30	30 mm	F3.4	12 dia.	25.5 mm

Extension Tubes for small camera
FZ-LESR



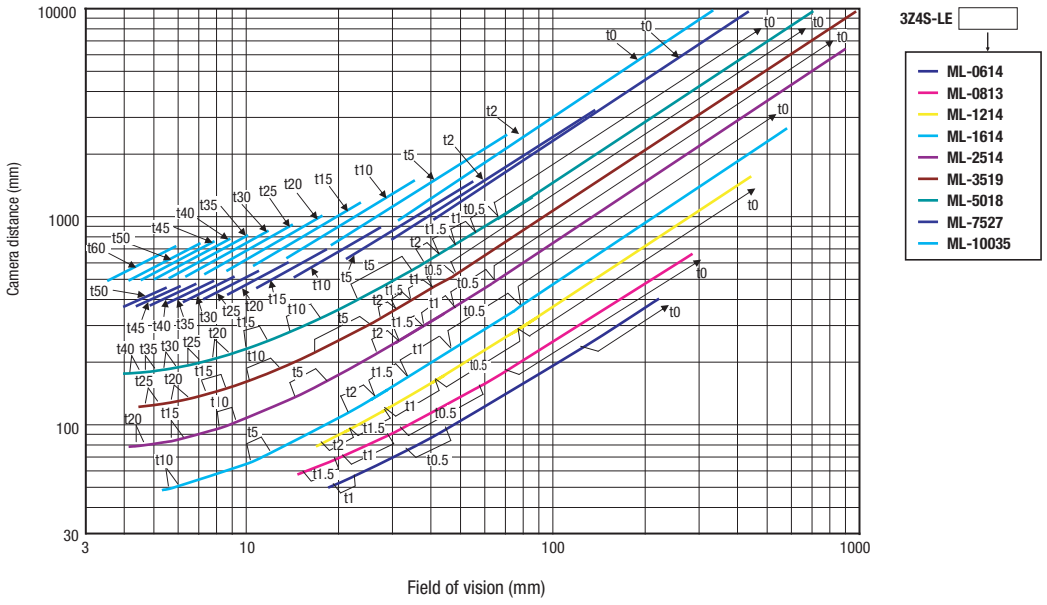
Optical Chart

2 million-pixel Digital camera FZ-S□2M

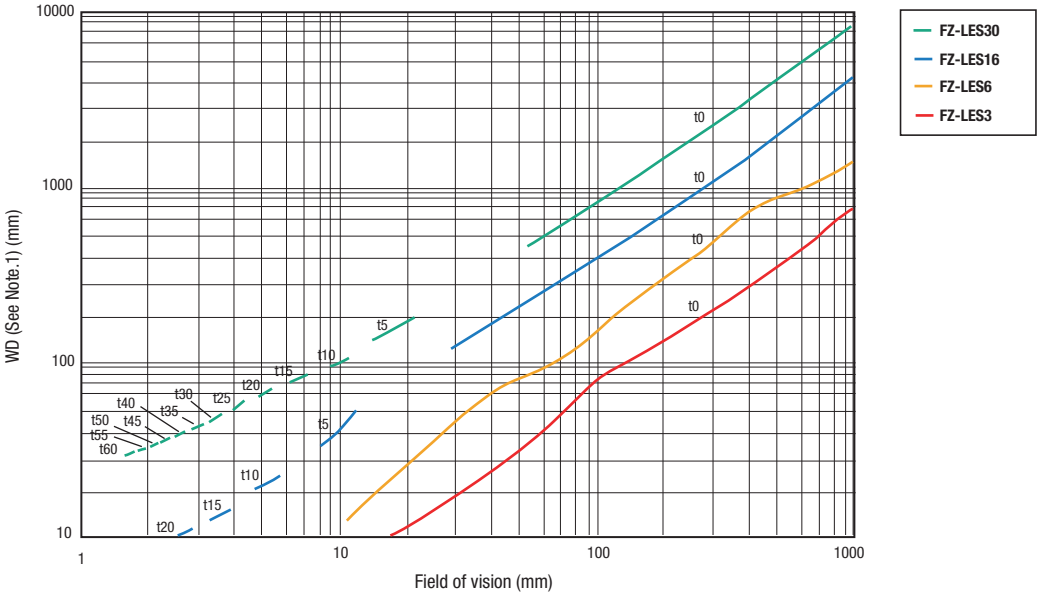


Note: The 5-mm Extension Tubes (3Z4S-LE ML-EXR) cannot be used with FZ-LEH25 Lenses.

300,000-pixel Hight-speed camera FZ-SH□, and Digital camera FZ-S□

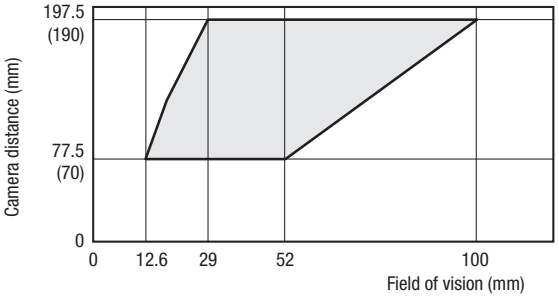


300,000-pixel Small digital cameras FZ-SF□, FZ-SP□



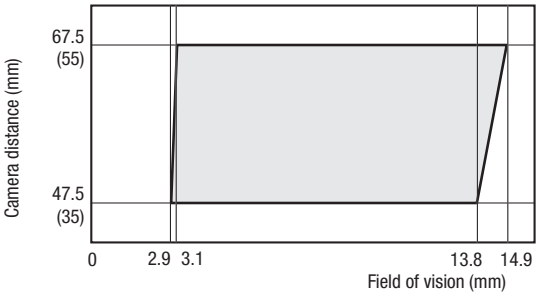
Note: The vertical axis represents WD, not installation distance.

Intelligent camera, autofocus camera with wide field of vision FZ-S□C100



Note: The value in parentheses is for the camera installation distance when using an Intelligent Camera.

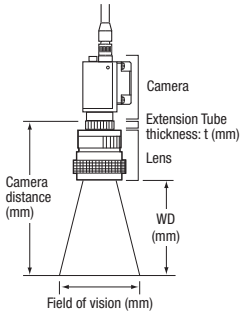
with narrow field of vision FZ-S□C15

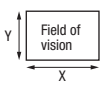


Note: 1. The value in parentheses is for the camera installation distance when using an Intelligent Camera.
2. Be sure to check the Instruction Sheet packed with the product before using an Intelligent Camera or Autofocus Camera.

■ Meaning of Optical Chart

The X axis of the optical chart shows the field of vision (mm) (Note 1), and the Y axis of the optical chart shows the camera installation distance (mm) (Note 2).



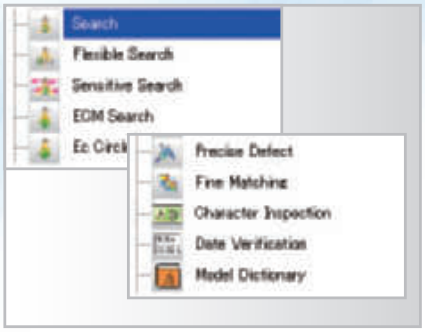


Note: 1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
2. The vertical axis represents WD for small cameras.

XPETICA LITE VISION SYSTEM

Simple, flexible & crystal clear

The new Xpectia lite integrates the benefits of a msmart camera and a powerful vision system in a single platform. The unique image clarity achieved by using an intelligent camera enables simple setup, fast installation and enhanced optical performance. In combination with the powerful Xpectia lite controller it takes you into a new dimension of image processing. Highest performance, simplicity and unique flexibility are defining a new standard for compact vision sensors.



Flexible Flow Configuration

Xpectia lite supports the smart camera technology from the FQ-series sensors. This allows fast and easy installation of the camera on the machine, without further optics and illumination. Crystal clear images can be easily captured using high-power lighting and a polarizing filter that eliminates glare.

Simple Operation

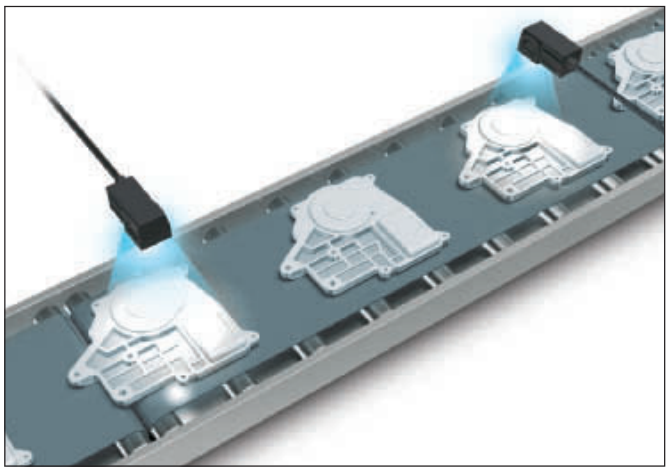
More than 20 processing items are provided by Xpectia lite, such as dimension measurements, various search items (pattern, contour), defects, edge and count tools. These processing items, can be combined in a flow program, offering branches or loops. This offers a new dimension of flexibility for compact vision sensors.

Open Network

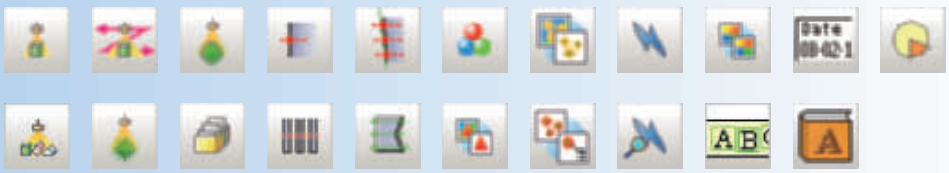
EtherNet/IP, a global standard for factory automation data networking, is supported for seamless integration into a production line or machine. This allows users to easily connect to any EtherNet/IP enabled devices from any manufacturer. Further communication is possible via TCP/IP, serial and parallel interfaces.

YOUR BENEFITS

- Crystal-clear image quality
- Real colour processing (16 million colours)
- C-mount and smart cameras
- EtherNet/IP & TCP/IP communication
- Simple and guided set-up
- Reliable results on any surface
- One platform for any application



21 Inspection and Measurement Items



Simple, flexible & crystal clear

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- Crystal-clear image quality
- Real colour processing (16 million colours)
- C-mount and smart cameras
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- Simple and guided set-up
- Reliable results on any surface
- One platform for any application

Ordering Information

Controllers

Appearance	Type			Remarks	Order code
	Controller integrated with LCD	Two-camera controllers	NPN	–	FZ4-600
			PNP	–	FZ4-605
		Four-camera controllers	NPN	–	FZ4-600-10
			PNP	–	FZ4-605-10
	Box-type controller	Two-camera controllers	NPN	–	FZ4-650
			PNP	–	FZ4-655
		Four-camera controllers	NPN	–	FZ4-650-10
			PNP	–	FZ4-655-10
	Box-type controller	Two-camera controllers	NPN	–	FZ4-L350
			PNP	–	FZ4-L355
		Four-camera controllers	NPN	–	FZ4-L350-10
			PNP	–	FZ4-L355-10

Cameras

Appearance	Type			Remarks	Order code
	Intelligent compact cameras	Wide view (Short-distance) □100 mm	Colour	Camera + Lens + High-power lighting	FZ-SQ100N
		Wide view (Long-distance) □100 mm	Colour		FZ-SQ100F
		Standard □50 mm	Colour		FZ-SQ050F
		Narrow view □10 mm	Colour		FZ-SQ010F
	Intelligent cameras	Wide field of vision	Colour	Camera + Zoom, Autofocus lens + intelligent lighting	FZ-SLC100
		Narrow field of vision	Colour		FZ-SLC15
	Autofocus cameras	Wide field of vision	Colour	Camera + Zoom, Autofocus lens	FZ-SZC100
		Narrow field of vision	Colour		FZ-SZC15
	Digital cameras	5 million pixels	Colour	Lens required	FZ-SC5M2
			Monochrome		FZ-S5M2
	Digital cameras	2 million pixels	Colour		FZ-SC2M
			Monochrome		FZ-S2M
	Digital cameras	300,000-pixels	Colour		FZ-SC
			Monochrome		FZ-S
	Small digital cameras	300,000-pixel flat type	Colour		FZ-SFC
			Monochrome		FZ-SF
	Small digital cameras	300,000-pixel pen type	Colour		FZ-SPC
			Monochrome		FZ-SP
	High-speed cameras	300,000-pixels	Colour		FZ-SHC
			Monochrome		FZ-SH

Cameras peripheral devices

Appearance	Type		Remarks	Order code
	CCTV lenses		–	3Z4S-LE Series
	Extension tubes		–	
	Low-distortion lenses		Low distortion lens for 2-million pixel cameras	FZ-LEH5/LEH8/LEH12/ LEH16/LEH25/LEH35/ LEH50/LEH75/LEH100
	Lenses for small camera		Lens for 300,000-pixel small cameras	FZ-LES3/LES6/LES16/ LES30
	Extension tubes for small camera		Extension tubes for 300,000-pixel small cameras	FZ-LESR
	Intelligent camera diffusion plate	Wide field of vision	–	FZ-SLC100-DL
		Narrow field of vision	–	FZ-SLC15-DL

Cables

Appearance	Type	Cable length	Remarks	Order code
	Camera cable	2 m, 5 m, 10 m[*1])	–	FZ-VS
	Bend resistant camera cables	2 m, 5 m, 10 m[*1]	–	FZ-VSB
	Right-angle camera cable[*2]	2 m, 5 m, 10 m[*1]	–	FZ-VSL
	Long-distance camera cable	15 m[*3]	–	FZ-VS2
	Long-distance right-angle camera cable	15 m[*3]	–	FZ-VSL2
	Cable extension unit	Maximum cable length: 45 m (Up to two extension units and three cables can be connected.)	–	FZ-VSJ
	Monitor cable	2 m, 5 m	–	FZ-VM
	Parallel cable	2 m, 5 m	–	FZ-VP
		2 m, 5 m, Connector-type	–	FZ-VPX[*4]

[*1] The 10-m cable cannot be used for the Intelligent camera, Autofocus camera and the 5 Million-pixel camera.
[*2] This cable has an L-shaped connector on the camera end.
[*3] The 15-m cable cannot be used for the Intelligent camera, Autofocus camera and the 5 Million-pixel camera.
[*4] Connector-terminal block conversion units can be connected (Recommended products: OMRON XW2B-50G4/50G5, XE2D-50G6).

Peripheral devices

Appearance	Type			Remarks	Order code
	LCD monitor			–	FZ-M08
	USB memory			Capacity: 1 GB	FZ-MEM1G
	Strobe controller	For 3Z4S-LT series	One channel	Required to control external lighting from a Controller	Manufactured by MORITEX Corporation 3Z4S-LT MLEK-C100E1TS2
	Strobe controller	For FZ-LT series	One channel		FZ-LTA100
			Two channels		FZ-LTA200

Ratings and Performance

Lite controller

Model		NPN	FZ4-L350	FZ4-L350-10	FZ4-600	FZ4-600-10	FZ4-650	FZ4-650-10
		PNP	FZ4-L355	FZ4-L355-10	FZ4-605	FZ4-605-10	FZ4-655	FZ4-655-10
No. of Cameras			2	4	2	4	2	4
Controller			Box-type		integrated with LCD		Box-type	
Processing resolution	Intelligent compact camera		752 (H) × 480 (V)					
	300,000-pixel camera		640 (H) × 480 (V)					
	2-million pixel camera		1600 (H) × 1200 (V)					
	5-million pixel camera		2488 (H) × 2044 (V)					
Main functions	Processing items	Inspections / Measurement	Search, Flexible Search, Sensitive Search, ECM Search, Ec Circle Search, Shape Search II, Classification, Edge Position, Edge Pitch, Scan Edge Position, Scan Edge Width, Colour Data, Gravity and Area, Labeling, Label Data, Defect, Precise Defect, Fine Matching, Character Inspection, Date Verification, 2D Code, Model Dictionary, Circle Angle, Circular Scan Edge Position, Circular Scan Edge Width					
		Image capturing	Camera image Input, Camera Image Input HDR, Camera Image Input HDR Lite, Camera Switching, Measurement Image Switching					
		Correcting images	Position Compensation, Filtering, Backgrond Suppression, Colour Gray Filter, Extract Colour Filter, Anti Colour Shading, Polar Transformation, Stripes Removal Filter II, Brightness Correct Filter					
		Assisting inspections / measurement	Calculation, Line Regression, Circle Regression, Set Unit Data, Get Unit Data, Set Unit Figure, Get Unit Figure, Trend Monitor, Image Logging, Data Logging, Elapsed Time, Wait, Focus, Iris, Precise Calibration, User Data, Image Conversion Logging					
		Branching processing	Conditional Branch, End, DI Branch					
		Outputting results	Serial data output, Parallel data output, Parallel judgement output, Fieldbus data output					
		Displaying results onthe monitor	Result Display, Display Image File, Display Last NG Image					
	Number of simultaneous inspections*1		No limit to setting (as permitted by memory capacity)					
	Position compensation		Yes (flexible combination with processing items for inspections and measurements)					
	Number of registered scenes		32					
Number of logged images (See note 1)	With intelligent compact camera	Connected to 1 camera	214					
		Connected to 2 camera	107					
		Connected to 3 camera	71					
		Connected to 4 camera	53					
	When connected to a 300,000-pixel camera	Connected to 1 camera	Colour camera: 250, Monochrome camera: 252					
		Connected to 2 camera	Colour camera: 125, Monochrome camera: 126					
		Connected to 3 camera	Colour camera: 83, Monochrome camera: 84					
		Connected to 4 camera	Colour camera: 62, Monochrome camera: 63					
	When connected to a 2 million-pixel camera	Connected to 1 camera	Colour camera: 40, Monochrome camera: 40					
		Connected to 2 camera	Colour camera: 20, Monochrome camera: 20					
		Connected to 3 camera	Colour camera: 13, Monochrome camera: 13					
		Connected to 4 camera	Colour camera: 10, Monochrome camera: 10					
	When connected to a 5 million-pixel camera	Connected to 1 camera	Colour camera: 11, Monochrome camera: 11					
		Connected to 2 camera	Colour camera: 5, Monochrome camera: 5					
I/O specification	Serial communications		RS-232C: 1CH		RS-232C/422: 1 CH			
	Network communications		Ethernet:1000BASE-T/100BASE-TX/ 10BASE-T		Ethernet:100BASE-TX/10BASE-T			
	Ethernet/IP		Ethernet port baud rate: 100 Mbps (100Base-TX)					
	Parallel I/O		11 inputs (RESET, STEP, DSA, and DI 0 to 7), 26 outputs (RUN, BUSY, GATE, OR, READY, ERROR, STGOUT 0 to 3, and DO 0 to 15)		13 inputs (RESET, STEP0/ENCTRIG_Z0, DSA0, ENCTRIG_A0, ENTRIG_B0, DI 0 to 7, 26 outputs (RUN, BUSY0, GATE0, OR0, READY0, ERROR, STGOUT 0 to 3, and DO 0 to 15) *STGOUT 2 to 3 only for camera 4CH type			
Monitor interface			Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots)		Controller integrated with LCD: integrated controller and LCD 12.1 inch TFT colour LCD (Resolution: XGA 1,024 × 768 dots)			
USB interface			2 CH (supports USB 1.1 and 2.0)		4 CH (supports USB 1.1 and 2.0)			
Ratings	Power supply voltage*2		20.4 to 26.4 VDC					
	Current consumption) (at 24 VDC)*3	With intelligent Compact Camera	4.0 A max.	5.5 A max.	5.0 A max.	7.5 A max.	5.0 A max.	7.5 A max.
		When connected to a intelligent or autofocus camera						
		When connected to a 300,000-pixel camera	2.6 A max.	2.9 A max.	3.7 A max.	4.9 A max.	3.7 A max.	4.9 A max.
		When connected to a 2 million-pixel camera						
		When connected to a 5 million-pixel camera						
Environmental immunity	Ambient temperature range		Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to +45°C for low cooling fan speeds 0 to +50°C for high cooling fan speeds Storage: -20 to 65°C (with no icing or condensation)			
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)					
	Ambient atmosphere		No corrosive gas					
	Degree of protection		IEC 60529 IP20					
Weight			Approx. 1.8 kg		Approx. 3.2 kg	Approx. 3.4 kg	Approx. 1.8 kg	Approx. 1.9 kg

*1 The number of logged images will vary when connecting multiple cameras with different models.
*2 Do not ground the positive terminal of the 24-VDC power supply to the Lite controller. If the positive terminal is grounded, electrical shock may occur when an SG (0-V) part, such as the case of the controller or camera, is touched.
*3 The current consumption when the maximum number of cameras supported by each controller are connected. If a strobe controller model is connected to a lamp, the current consumption is as high as when an Intelligent camera is connected.

LCD monitor

Model	FZ-M08
Size	8.4 inches
Type	Liquid crystal colour TFT
Resolution	1,024×768 dots
Input signal	Analog RGB video input, 1 channel
Power supply voltage	21.6 to 26.4 VDC
Current consumption	Approx. 0.7 A max.
Ambient temperature range	Operating: 0 to 50°C, Storage: –25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)
Weight	Approx. 1.2 kg
Accessories	Instruction Sheet and 4 mounting brackets

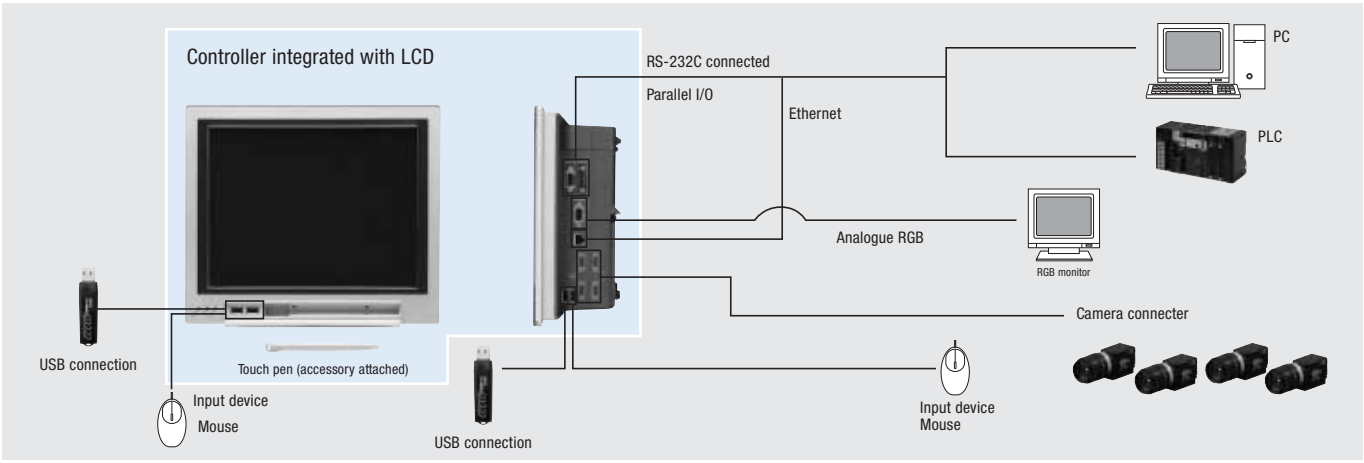
Monitor cable

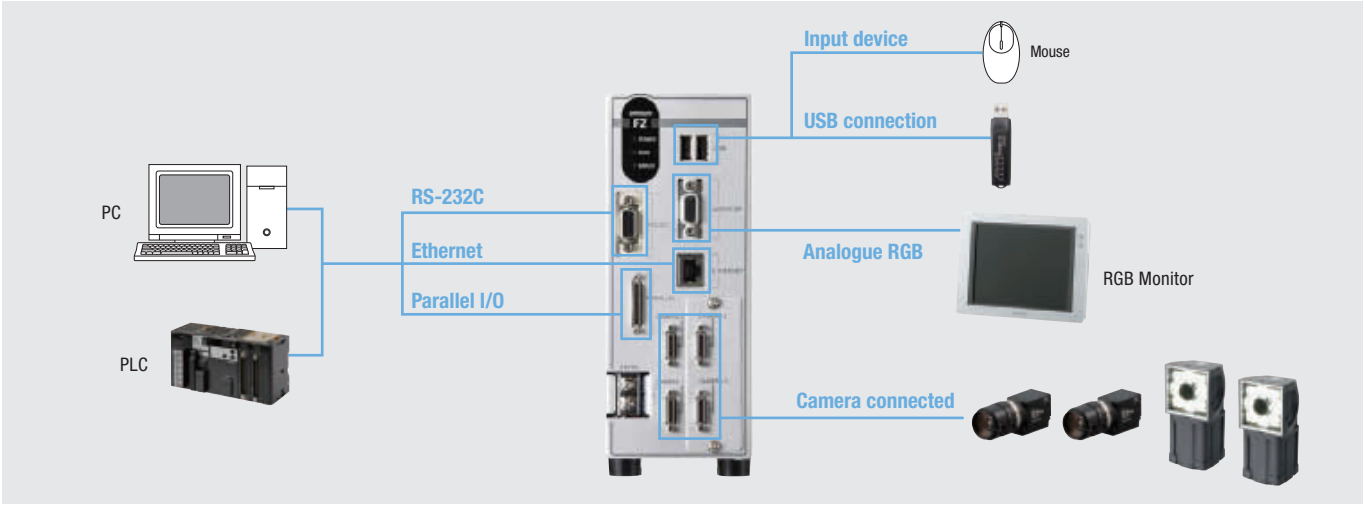
Model	FZ-VM
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times
Ambient temperature range	Operation: 0 to +50°C, Storage: –20 to +65°C (with no icing or condensation)
Ambient humidity range	Operation and storage: 35% to 85%RH (with no condensation)
Ambient atmosphere	No corrosive gases
Material	Cable sheath: heat-resistant PVC Connector: PVC
Minimum bending radius	75 mm
Weight	approx.170 g

Intelligent compact camera

Model		FZ-SQ010F	FZ-SQ050F	FZ-SQ100F	FZ-SQ100N
Field of vision		7.5×4.7 to 13×8.2 mm	13×8.2 to 53×33 mm	53×33 to 240×153 mm	29×18 to 300×191 mm
Installation distance		38 to 60 mm	56 to 215 mm	220 to 970 mm	32 to 380 mm
Image input	Image processing method	Real colour			
	Image elements	1/3-inch colour CMOS			
	Shutter	1/250 to 1/32258			
	Processing resolution	752 (H) × 480 (V)			
	Partial function	8 to 752 lines			
Lighting	Lighting method	Pulse			
	Lighting colour	White			
	LED class	Class 2			
Environmental immunity	Ambient temperature range	Operating: 0 to 50°C, Storage: –25 to 65°C (with no icing or condensation)			
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
	Ambient atmosphere	No corrosive gas			
	Degree of protection	IEC 60529 IP40 (with polarizing filter attachment mounted.)			
Materials		Camera: PBT, PC, SUS Mounting bracket: PBT Polarizing filter attachment: PBT, PC			
Weight		Approx. 160 g		Approx. 150 g	
Accessories		• Mounting bracket (FQ-XL) (1) • Polarizing filter attachment (FQ-XF1) (1) • Instruction manual • Member registration sheet			

System configuration



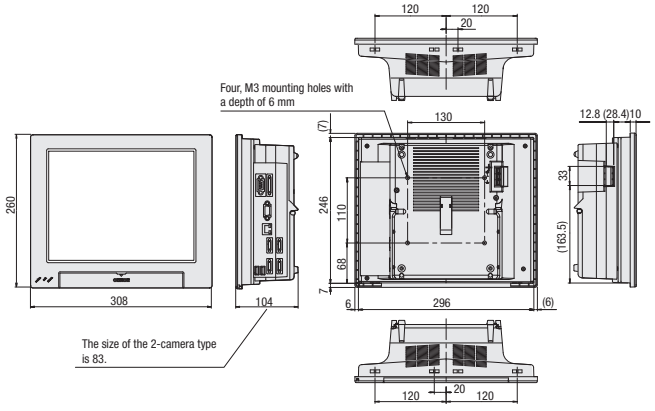


Dimensions

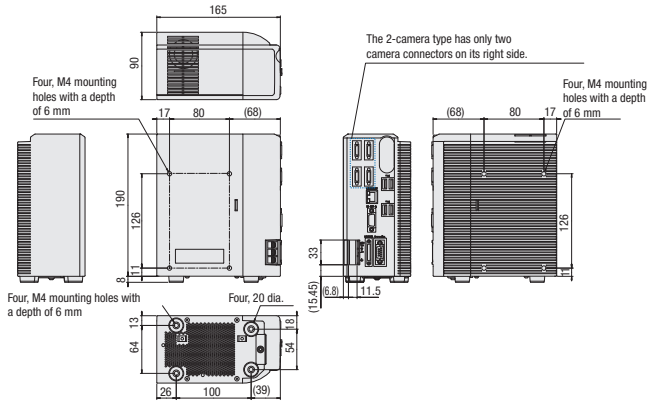
(Unit: mm)

Controllers

LCD integrated type
FZ4-60□/FZ4-60□-10



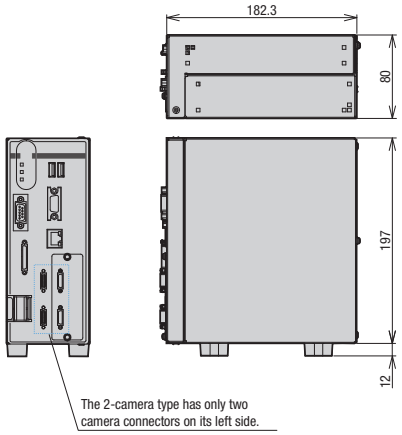
Box-type
FZ4-65□/FZ4-65□-10



Dimensions

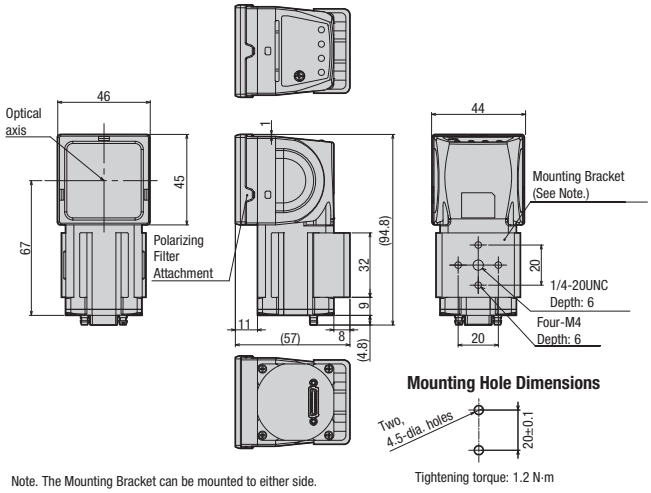
(Unit: mm)

FZ4-L35□/FZ4-L35□-10



Intelligent Compact Camera

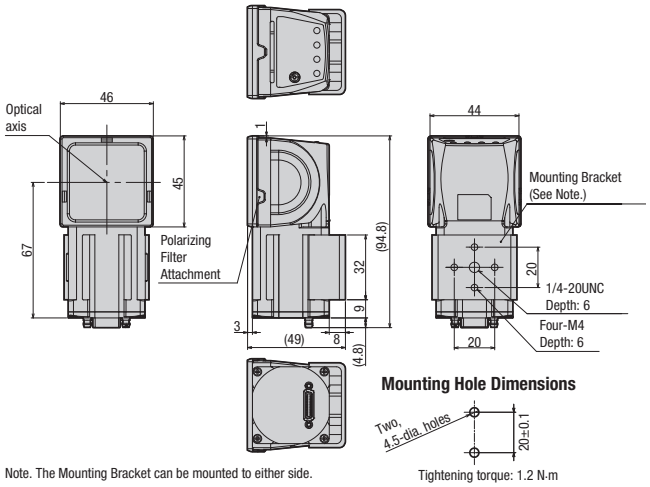
Narrow View and Standard
FZ-SQ010F
FZ-SQ050F



Note. The Mounting Bracket can be mounted to either side.

Tightening torque: 1.2 N·m

Wide View
FZ-SQ100F (Long-distance)
FZ-SQ100N (Short-distance)

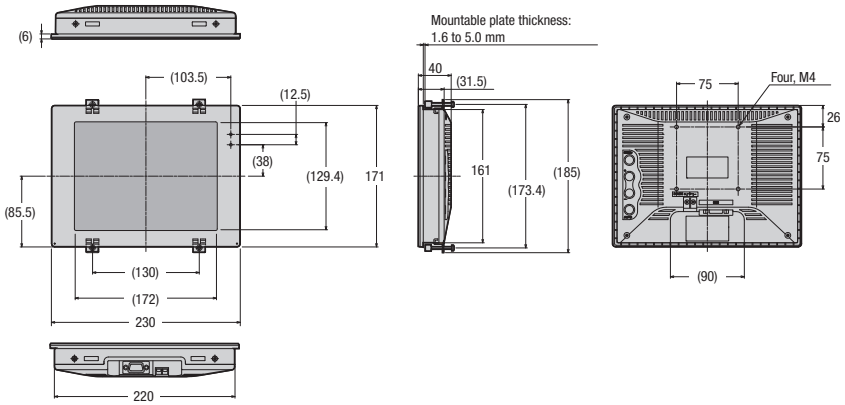


Note. The Mounting Bracket can be mounted to either side.

Tightening torque: 1.2 N·m

LCD Monitor

FZ-M08



XPECTIA FJ VISION SYSTEM

Fast machine integration and easy customization

The new customisable Xpectia FJ Series Vision System combines the benefits of a compact system with the power and flexibility of an industrial PC platform. The system will enable you to develop tailored vision solutions quickly, no matter if you are creating a totally new application or modifying an existing one. Start with the proven Xpectia platform and follow our golden rule: configure where you can and program only where you need to. Easy HMI creation, unique flexibility and fast integration define this new class of vision system. The Xpectia FJ Series is available with a range of controllers and cameras, suitable for every application. This eliminates the time needed to integrate components and delivers a platform with the highest quality and reliability.

Highly flexible development

Imagine how much money you could save by reducing your current development time by 50%. With the FJ Series you can do just that. That's because you can build processing flow simply by listing the processing items for each measurement. Other features that accelerate development include: sample GUIs, options to re-use existing software, built-in touchscreens, and more.

Proven reliability

All the hardware and software components are completely compatible. In addition, the controllers use flash memory – not hard disc drives – so they always remain highly reliable even in a hostile factory environment.

Stable and high-speed inspection

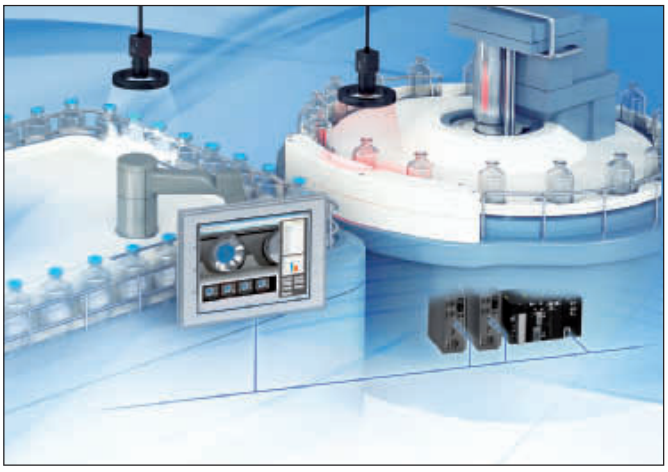
The Halcon library of algorithms provides high-speed processing and measurement. In addition, the FJ Series' High Dynamic Range and Real Colour sensing techniques ensure robust and stable operation.

YOUR BENEFITS

Quick customisation:
- Starting from a complete system
- Fast drag and drop programming
- Choice of ready-made GUIs

Seamless integration:
- Proven component compatibility
- Wide selection of intelligent cameras

Stable, high-speed processing:
- Advanced algorithms
- HDD-less controllers

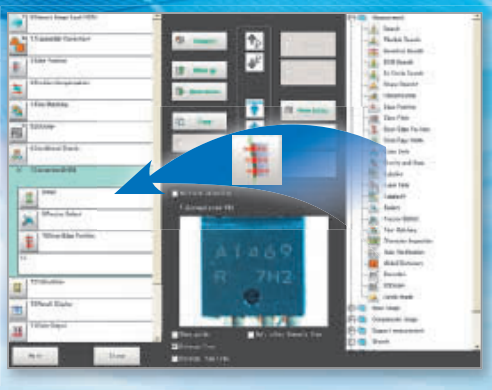


XPETICA FJ VISION SYSTEM

Smart programming

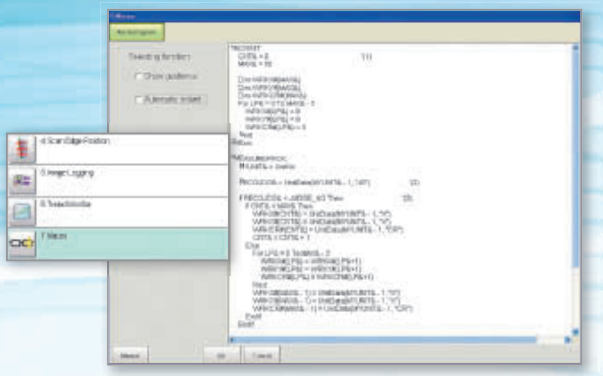
Drag and drop with image processing

You can create new measurement and inspection flows quickly and easily with our ready-made modules. Simply choose from the 60+ modules and drag and drop them to define your required image-input, measurement and other sequences – as well as building your processing flows. No more searching subroutine libraries and painstakingly piecing them together. You can immediately create new inspection functions from our ready-made software modules.



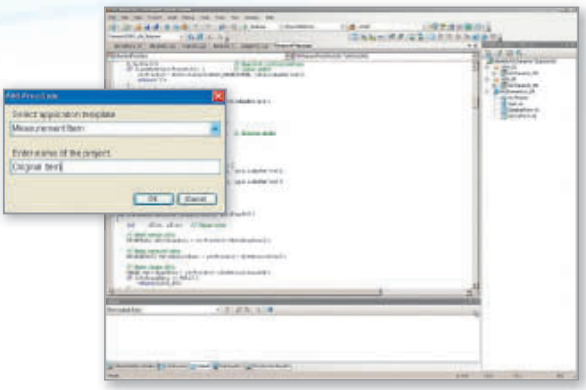
Time-saving Macros

We also offer a wide range of Macros to further accelerate your development process – especially for your calculation functions. Simply drag and drop the required Macro into your flow.



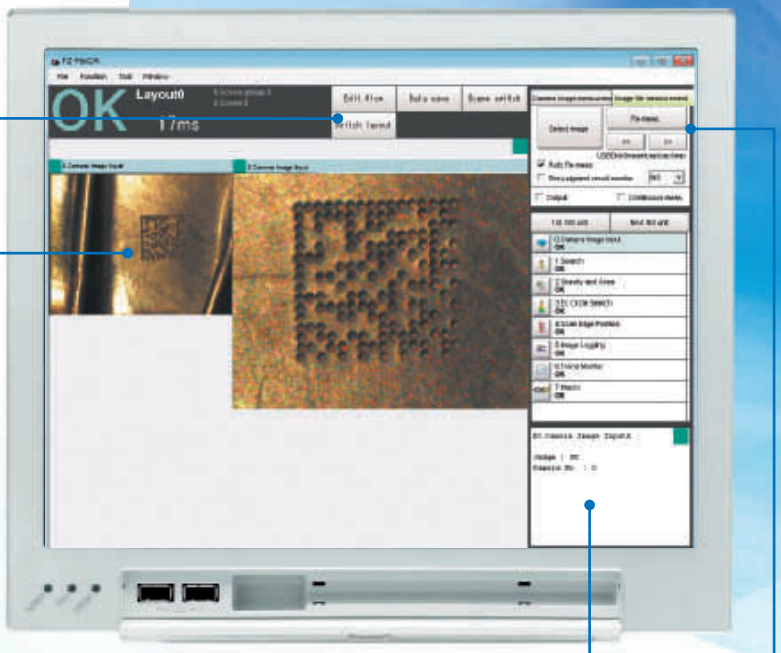
Own developed algorithms

If the item you need is not included in the new FJ Series software suite, you can easily create your own item using Microsoft® Visual Studio® and the “Application Producer”. The Development Wizard and code samples ensure that creating programs, including those for your GUI, is always quick and simple.



*Microsoft® Visual Studio® is a registered trademark of Microsoft Corporation.

Easy HMI configuration



Show only the buttons you need

Choose from our library of buttons and position them anywhere on-screen to best support your daily operation, without 'screen clutter'.

Add a camera image

With just one click.

Eight screen layout

Up to 8 screens can be stored depending on the application or user classification.

Move windows freely

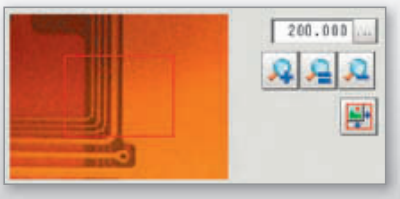
Drag and drop windows where you want.
You can also change the box size and delete.

Free HMI programming

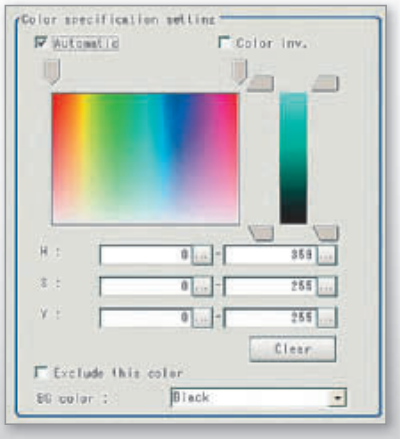
Create the HMI to fit your needs

You can create original HMI and GUIs quickly with Visual Studio®, rich customisable control units and program samples in the FJ "Application Producer".

Progam sample for bar graph



Zoom browser



Colour setting control

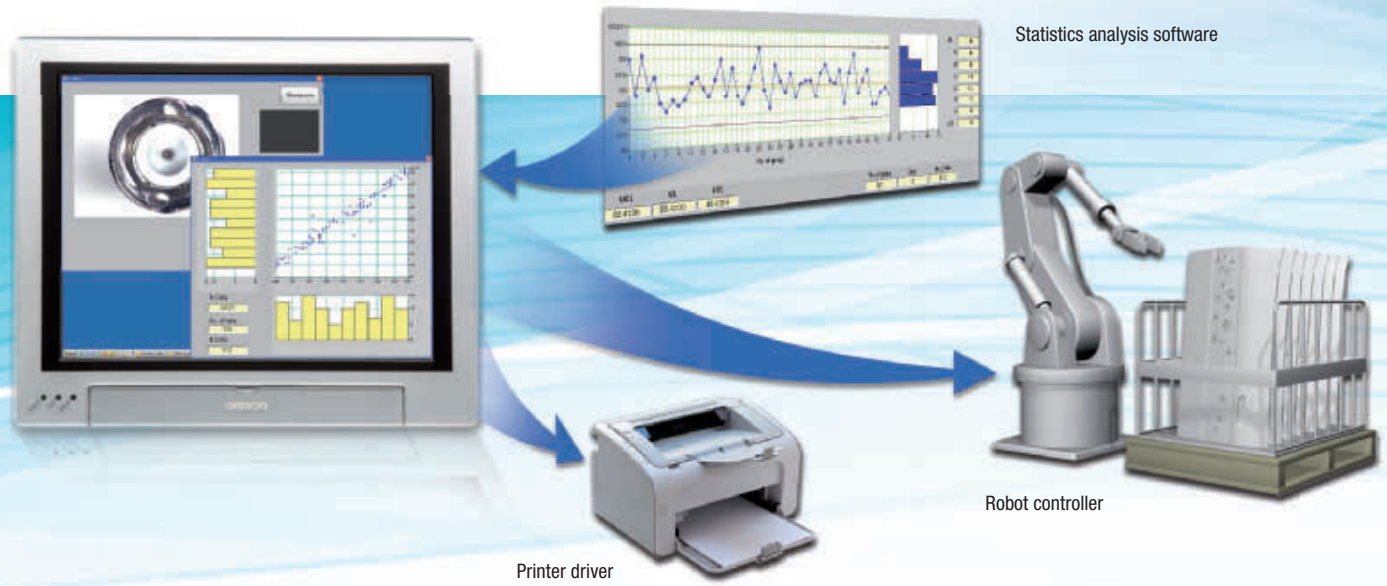
XPETICA FJ VISION SYSTEM

Seamless connectivity with your machine

Working in perfect harmony with your machine

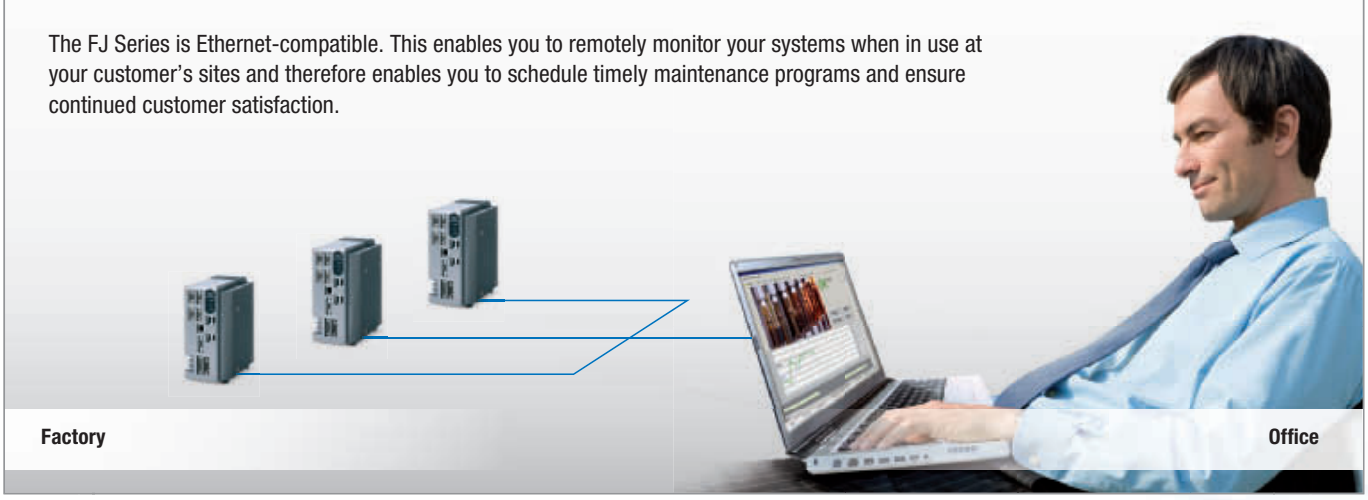
The FJ Series controllers are Windows-based Open IPCs on which you can install your regular PC programs. You can also install printer and robot controller driver software.

The Windows-based environment in the FJ Series allows you to reuse your existing software which supports the building of your machine's vision application such as statistical, communication, printer driver and other software. This not only saves time but enables you to continue benefitting from previous investments.



Remote monitoring and control

The FJ Series is Ethernet-compatible. This enables you to remotely monitor your systems when in use at your customer's sites and therefore enables you to schedule timely maintenance programs and ensure continued customer satisfaction.

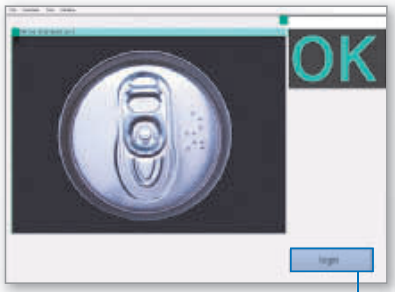


Build in security – more customer satisfaction

You can further delight your customers by building in security functions that prevent operational errors on the shop floor. Simply choose from the sample, ready-made code in the “Application Producer”.

Access control operation

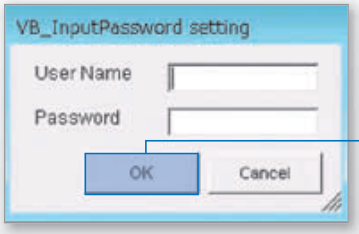
Running screen



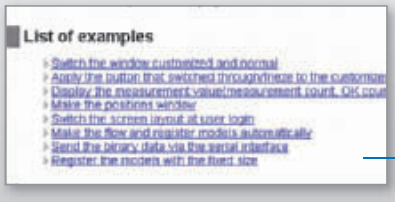
Measurement result clearly displayed

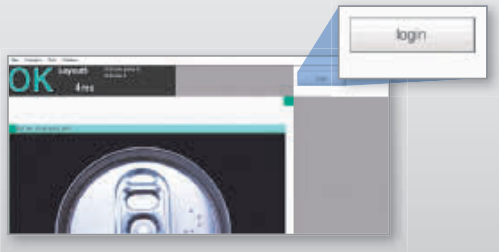
Administrative screen

Tuning menu



Easy implementation





1. Select from the sample list in the “Application Producer”

2. Drag and Drop the zip file

3. The login button is automatically created

Always keeping you up to date with the latest software

You can get free downloads of the latest versions of software, sample programs, and new technical documentation any time after purchasing the FJ Series. With Omron, you will always have access to the latest systems and knowledge.

http://www.omron-cxone.com/pc_v/index.html

Xpectia FJ vision system

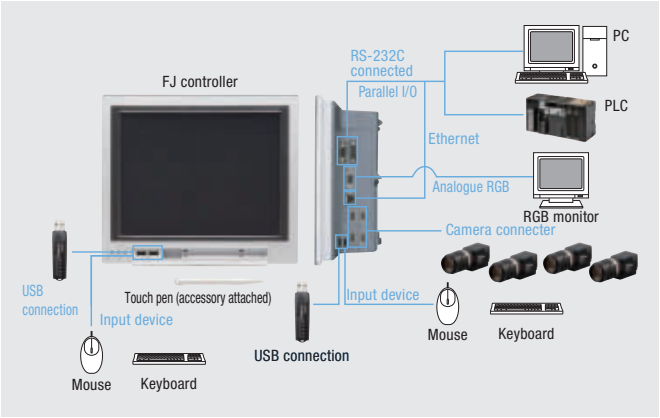
The new customisable Xpectia FJ Series Vision System combines the benefits of a compact system with the power and flexibility of an industrial PC platform. The system will enable you to develop tailored vision solutions quickly, no matter if you are creating a totally new application or modifying an existing one. Easy HMI creation, unique flexibility and fast integration define this new class of vision system.

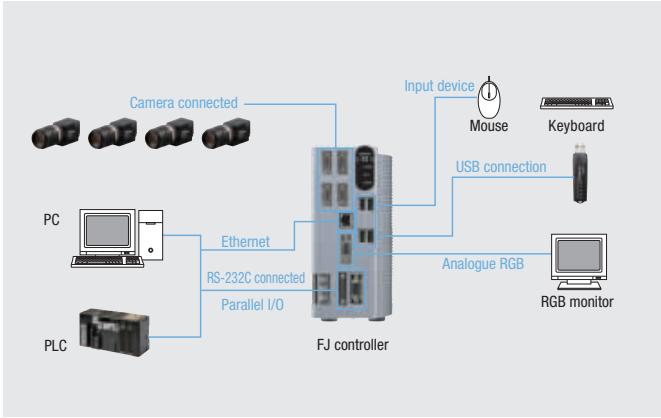
Seamless integration and easy customization

- Stable and high-speed inspection
- Fast drag and drop programming
- Time-saving macros
- Choice of ready-made GUIs
- Proven component compatibility
- Wide selection of intelligent cameras

System configuration

Standard configuration





For Customization

Development environment Application producer

Sample codes and Development Wizard for easy customization are available.

Ordering Information

Controller

CPU	Type	Dual-task	HALCON installed*1	No. of Cameras	Output	Order code
Core i5 2.4 GHz	Controller integrated with LCD	Yes	No	2	NPN	FJ-3000
		Yes	No	4	NPN	FJ-3000-10
		Yes	No	2	PNP	FJ-3005
		Yes	No	4	PNP	FJ-3005-10
		Yes	Yes	2	NPN	FJ-H3000-E
		Yes	Yes	4	NPN	FJ-H3000-10-E
		Yes	Yes	2	PNP	FJ-H3005-E
		Yes	Yes	4	PNP	FJ-H3005-10-E
	Box-type Controller	Yes	No	2	NPN	FJ-3050
		Yes	No	4	NPN	FJ-3050-10
		Yes	No	2	PNP	FJ-3055
		Yes	No	4	PNP	FJ-3055-10
		Yes	Yes	2	NPN	FJ-H3050-E
		Yes	Yes	4	NPN	FJ-H3050-10-E
		Yes	Yes	2	PNP	FJ-H3055-E
		Yes	Yes	4	PNP	FJ-H3055-10-E
Atom 1.6 GHz	Box-type Controller	No	No	2	NPN	FJ-350
		No	No	4	NPN	FJ-350-10
		No	No	2	PNP	FJ-355
		No	No	4	PNP	FJ-355-10

Controller integrated with LCD

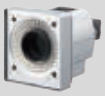
Box-type Controller

*1 HALCON runtime license has been installed. The development of HALCON requires HDevelop.

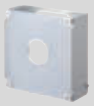
Development Environment

Type	Operating environment	Order code
Application Producer	– CPU: Intel Pentium Processor (SSE2 or higher) – OS: Windows XP Professional (32bit) Service pack 3 or later, or Windows 7 Professional (32bit) or Enterprise (32bit) or Ultimate (32bit) – .NET Framework: .NET Framework 3.5 or higher – Memory: At least 2 GB RAM Available disk space: At least 2 GB – Browser: Microsoft® Internet Explorer 6.0 or later – Display: XGA (1024×768), True Color (32-bit) or higher – Optical drive: CD/DVD drive – The following software is required to customize the software: Microsoft® Visual Studio® 2010 Professional	FJ-AP1

Cameras

Appearance	Type			Remarks	Order code
	Digital Cameras	300,000-pixels	Color	Lens required	FZ-SC
			Monochrome		FZ-S
	Digital Cameras	2 million pixels	Color		FZ-SC2M
			Monochrome		FZ-S2M
	Digital Cameras	5 million pixels	Color		FZ-SC5M2
			Monochrome		FZ-S5M2
	Small Digital Cameras	300,000-pixel flat type	Color	Lens for small cameras required	FZ-SFC
			Monochrome		FZ-SF
	Small Digital Cameras	300,000-pixel pen type	Color		FZ-SPC
			Monochrome		FZ-SP
	High-speed Cameras	300,000-pixels	Color	Lens required	FZ-SHC
			Monochrome		FZ-SH
	Intelligent Compact Cameras	Wide View (Long-distance)	Color	Camera + Lens + High-power Lighting	FZ-SQ100F
		Wide View (Short-distance)	Color		FZ-SQ100N
		Standard	Color		FZ-SQ050F
		Narrow View	Color		FZ-SQ010F
	Intelligent Cameras	Wide field of vision	Color	Camera + Zoom, Autofocus Lens + Intelligent Lighting	FZ-SLC100
		Narrow field of vision	Color		FZ-SLC15
	Autofocus Cameras	Wide field of vision	Color	Camera + Zoom, Autofocus Lens	FZ-SZC100
		Narrow field of vision	Color		FZ-SZC15

Cameras Peripheral Devices

Appearance	Type		Remarks	Order code
	CCTV Lenses		–	3Z4S-LE Series
	Extension Tubes			
	Low-distortion Lenses		Low distortion lens for 2-million and 5-million Pixel Cameras	FZ-LEH5/LEH8/LEH12/ LEH16/LEH25/LEH35/ LEH50/LEH75/LEH100
	Lenses for Small Camera		Lens for 300,000-pixel Small Cameras	FZ-LES3/LES6/LES16/ LES30
	Extension Tubes for Small Camera		Extension Tubes for 300,000-pixel Small Cameras	FZ-LESR
	Intelligent Camera Diffusion Plate	Wide field of vision	–	FZ-SLC100-DL
		Narrow field of vision		FZ-SLC15-DL
	Halation cut illumination		Integrated unit combining special Halation cut illumination, strobe controller and camera (without lens)	FZ-SXCRB7018BR-4S
			Integrated unit combining special Halation cut illumination and strobe controller	FZ-LTCRB7018BR-4S
			Special Halation cut illumination only	FZ-LTRB7018BR-4S
	For Intelligent Compact Camera	Mounting brackets	–	FQ-XL/XL2
		Polarizing Filter Attachment		FQ-XF1

Cables

Appearance	Type	Cable length	Remarks	Order code
	Camera Cable	2 m, 5 m, 10 m[*1]	–	FZ-VS
	Bend resistant Camera Cables	2 m, 5 m, 10 m[*2])		FZ-VSB
	Right-angle Camera Cable[*3]	2 m, 5 m, 10 m[*1]		FZ-VSL
	Long-distance Camera Cable	15 m[*4]		FZ-VS2
	Long-distance Right-angle Camera Cable	15 m[*4]		FZ-VSL2
	Cable Extension Unit	Maximum cable length: 45 m (Up to two Extension Units and three Cables can be connected.)[*5]		FZ-VSJ
	Monitor Cable	2 m, 5 m		FZ-VM
	Parallel Cable	2 m, 5 m		FZ-VP
		2 m, 5 m, Connector-type		FZ-VPX[*6]

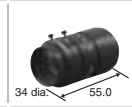
[*1] The 10-m Cable cannot be used for the Intelligent Camera, Autofocus Camera and 5-million pixel camera.
[*2] The 10-m Cable cannot be used for the Intelligent Camera, Autofocus Camera, 2-million pixel camera and 5-million pixel camera.
[*3] This Cable has an L-shaped connector on the Camera end.
[*4] The 15-m Cable cannot be used for the Intelligent Camera, Autofocus Camera and 5-million pixel camera.
[*5] Maximum cable length depends on type of camera and cable length to connect. For details, refer to "Cameras / Cables Connection Table" on page 7.
[*6] Connector-Terminal Block Conversion Units can be connected (Recommended Products: OMRON XW2B-50G4/50G5, XE2D-50G6).

Peripheral Devices

Appearance	Type			Remarks	Order code
	LCD Monitor			For box-type controller	FZ-M08
	USB Memory			Capacity: 1 GB	FZ-MEM1G
	VESA attachment			For installing the controller integrated with LCD	FZ-VESA
	Desktop controller stand			For installing the controller integrated with LCD	FZ-DS
	Lighting Controller	For FL-Series		Required to control external lighting from a Controller	FL-TCC1
	Strobe Controller	For 3Z4S-LT Series	One channel		Manufactured by MORITEX Corporation 3Z4S-LT MLEK-C100E1TS2
	Strobe Controller	For FZ-LT Series	One channel		FZ-LTA100
			Two channels		FZ-LTA200
–	Adapter for the strobe controller			Required to mount a strobe controller on a 5-million pixel camera when using 3Z4S-LT series	Manufactured by MORITEX Corporation 3Z4S-LT LBK-003
–	External Lighting			–	3Z4S-LT Series
					FZ-LT Series
					FL-Series

Lenses

High-resolution, Low-distortion Lenses

Lens model	FZ-LEH5	FZ-LEH8	FZ-LEH12	FZ-LEH16	FZ-LEH25	FZ-LEH35	FZ-LEH50	FZ-LEH75	FZ-LEH100
Appearance									
Focal length	5 mm	8 mm	12.5 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
Brightness	F2.8	F1.4	F1.4	F1.4	F1.4	F2	F2.8	F2.5	F2.8
Filter size	M40.5 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M27.0 P0.5	M34.0 P0.5	M40.5 P0.5

CCTV Lenses

Lens model	3Z4S-LE ML-0614	3Z4S-LE ML-0813	3Z4S-LE ML-1214	3Z4S-LE ML-1614	3Z4S-LE ML-2514	3Z4S-LE ML-3519	3Z4S-LE ML-5018	3Z4S-LE ML-7527	3Z4S-LE ML-10035
Appearance									
Focal length	6 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm	100 mm
Brightness	F1.4	F1.3	F1.4	F1.4	F1.4	F1.9	F1.8	F2.7	F3.5
Filter size	M27 P0.5	M25.5 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M27 P0.5	M30.5 P0.5	M30.5 P0.5	M30.5 P0.5

Lenses for small camera

Lens model	FZ-LES3	FZ-LES6	FZ-LES16	FZ-LES30
Appearance				
Focal length	3 mm	6 mm	16 mm	30 mm
Brightness	F2.0	F2.0	F3.4	F3.4

Extension Tubes

Model	3Z4S-LE-ML-EXR
Contents	Set of 7 tubes (40 mm, 20 mm, 10 mm, 5 mm, 2.0 mm, 1.0 mm, and 0.5 mm) Maximum outer diameter: 30 mm dia.

Extension Tubes for small camera

Model	FZ-LESR
Contents	Set of 3 tubes (15 mm, 10 mm, 5 mm) Maximum outer diameter: 12 mm dia.

Precautions

- Do not use the 0.5-mm, 1.0-mm, and 2.0-mm Extension Tubes attached to each other. Since these Extension Tubes are placed over the threaded section of the Lens or other Extension Tube, the connection may loosen when more than one 0.5-mm, 1.0-mm or 2.0-mm Extension Tube are used together.
- Reinforcement may be required for combinations of Extension Tubes exceeding 30 mm if the Camera is subject to vibration.

Ratings and Performance

Controller

Model		NPN Output	FJ-3000	FJ-3000-10	FJ-3050	FJ-3050-10	FJ-H3000-E	FJ-H3000-10-E	FJ-H3050-E	FJ-H3050-10-E	FJ-350	FJ-350-10
		PNP Output	FJ-3005	FJ-3005-10	FJ-3055	FJ-3055-10	FJ-H3005-E	FJ-H3005-10-E	FJ-H3055-E	FJ-H3055-10-E	FJ-355	FJ-355-10
Controller type			Controller integrated with LCD		Box-type controller		Controller integrated with LCD		Box-type controller		Box-type controller	
No. of cameras			2	4	2	4	2	4	2	4	2	4
CPU			Intel Core i5-520E Processor 2.40 GHz								Intel Atom N270 Processor 1.6 GHz	
Main memory			3 GB								2 GB	
Storage			Compact Flash 2 GB									
OS			Windows Embedded Standard 2009									
Dual-task			Yes								No	
HALCON installed			No				Yes				No	
Connected camera			Can be connected to all cameras.									
Operation			Controller integrated with LCD: touch pen, mouse, etc., Box-type controller: mouse, etc.									
Processing resolution			Intelligent Compact Camera: 752 (H) × 480 (V), 300,000-pixel camera: 640 (H) × 480 (V), 2-million pixel camera: 1600 (H) × 1200 (V), 5-million pixel camera: 2488 (H) × 2044 (V)									
No. of scenes			32									
Number of logged images	When connected to an Intelligent Compact Camera	Connected to 1 camera	214									
		Connected to 2 cameras	107									
		Connected to 3 cameras	71									
		Connected to 4 cameras	53									
	When connected to a 300,000-pixel camera	Connected to 1 camera	Color camera: 250, Monochrome Camera: 252									
		Connected to 2 cameras	Color camera: 125, Monochrome Camera: 126									
		Connected to 3 cameras	Color camera: 83, Monochrome Camera: 84									
		Connected to 4 cameras	Color camera: 62, Monochrome Camera: 63									
	When connected to a 2 million-pixel camera	Connected to 1 camera	Color camera: 40, Monochrome Camera: 40									
		Connected to 2 cameras	Color camera: 20, Monochrome Camera: 20									
		Connected to 3 cameras	Color camera: 13, Monochrome Camera: 13									
		Connected to 4 cameras	Color camera: 10, Monochrome Camera: 10									
	When connected to a 5 million-pixel camera	Connected to 1 camera	Color camera: 15, Monochrome Camera: 15									
		Connected to 2 cameras	Color camera: 7, Monochrome Camera: 7									
		Connected to 3 cameras	Color camera: 5, Monochrome Camera: 5									
		Connected to 4 cameras	Color camera: 3, Monochrome Camera: 3									
Serial communications			RS-232C/422A: 1CH								RS-232C: 1CH	
Network communications			Ethernet 100BASE-TX/10BASE-T								Ethernet 1000BASE-T/ 100BASE-TX/10BASE-T	
EtherNet/IP			Ethernet port baud rate: 100 Mbps (100BASE-TX)									
Parallel I/O			17 inputs (RESET, STEP0/ENCTRIG_Z0, STEP1/ENCTRIG_Z1, DSA0 to 1, ENCTRIG_A0 to 1, ENCTRIG_B0 to 1, DI0 to 7) 29 outputs (RUN/BUSY1, BUSY0, GATE0 to 1, OR0 to 1, READY0 to 1, ERROR, STGOUT0 to 3*, DO0 to 15)								11 inputs (RESET, STEP, DSA, DI0 to 7) 26 outputs (RUN, BUSY, GATE, OR, READY, ERROR, STGOUT0 to 3[*1], DO0 to 15)	
Monitor interface			Controller integrated with LCD: integrated controller and LCD 12.1 inch TFT color LCD (Resolution: XGA 1,024 × 768 dots) Box-type controller: Analog RGB video output, 1 channel (Resolution: XGA 1,024 × 768 dots)									
USB interface			4 channels (supports USB 1.1 and 2.0)								2 channels (supports USB 1.1 and 2.0)	
Power supply voltage			20.4 to 26.4 VDC									
Current consumption (at 24.0 VDC)	When connected to an Intelligent Compact Camera, intelligent or autofocus camera		5.0 A max.	7.5 A max.	5.0 A max.	7.5 A max.	5.0 A max.	7.5 A max.	5.0 A max.	7.5 A max.	4.0 A max.	5.5 A max.
	When connected to a 300,000-pixel, 2 million-pixel, or 5 million-pixel camera		3.7 A max.	4.9 A max.	3.7 A max.	4.9 A max.	3.7 A max.	4.9 A max.	3.7 A max.	4.9 A max.	2.6 A max.	2.9 A max.
Ambient temperature range			Operating: 0 to +45°C for low cooling fan speeds 0 to +50°C for high cooling fan speeds Storage: -20 to 65°C (with no icing or condensation)								Operating: 0 to 50°C Storage: -20 to 65°C (with no icing or condensation)	
Ambient humidity range			Operating and storage: 35 to 85°C (with no condensation)									
Weight			Approx. 3.4 kg		Approx. 1.9 kg		Approx. 3.4 kg		Approx. 1.9 kg		Approx. 1.8 kg	
Accessories			Controller integrated with LCD: touch pen (one, inside the front panel), Instruction Manual, 6 mounting brackets, Member registration sheet Box-type controller: Instruction Manual, Member registration sheet									

*1 STGOUT 2 to 3 only for camera 4ch type

Digital Cameras

	FZ-S	FZ-SC	FZ-S2M	FZ-SC2M	FZ-S5M2	FZ-SC5M2
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements		Interline transfer reading all pixels, 1/1.8-inch CCD image elements		Interline transfer reading all pixels, 2/3-inch CCD image elements	
Color/Monochrome	Monochrome	Color	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)		1600 (H) × 1200 (V)		2448 (H) × 2044 (V)	
Pixel size	7.4 (μm) × 7.4 (μm)		4.4 (μm) × 4.4 (μm)		3.45 (μm) × 3.45 (μm)	
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s		Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s		Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s	
Partial function	12 to 480 lines		12 to 1200 lines		12 to 2044 lines	
Frame rate (image read time)	80 fps (12.5 ms)		30 fps (33.3 ms)		16 fps (62.5 ms)	
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance					
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)					
Weight	Approx. 55 g		Approx. 76 g		Approx.140 g	
Accessories	Instruction manual					

Small Digital Cameras

	FZ-SF	FZ-SFC	FZ-SP	FZ-SPC
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements			
Color/Monochrome	Monochrome	Color	Monochrome	Color
Effective pixels	640 (H) × 480 (V)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s			
Partial function	12 to 480 lines			
Frame rate (image read time)	80 fps (12.5 ms)			
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance			
Ambient temperature range	Operating: 0 to 50°C (camera amp) 0 to 45°C (camera head) Storage: -25 to 65°C (with no icing or condensation)		Operating: 0 to 50°C (camera amp) 0 to 45°C (camera head) Storage: -25 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)		Operating and storage: 35% to 85% (with no condensation)	
Weight	Approx.150 g		Approx.150 g	
Accessories	Instruction manual, installation bracket, Four mounting brackets(M2)		Instruction manual	

High-speed Cameras

	FZ-SH	FZ-SHC
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements	
Color/Monochrome	Monochrome	Color
Effective pixels	640 (H) × 480 (V)	
Pixel size	7.4 (μm) × 7.4 (μm)	
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s	
Partial function	12 to 480 lines	
Frame rate (image read time)	204 fps (4.9 ms)	
Field of vision, installation distance	Selecting a lens according to the field of vision and installation distance	
Ambient temperature range	Operating: 0 to 40°C Storage: -25 to 65°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)	
Weight	Approx.105 g	
Accessories	Instruction manual	

Intelligent Compact Cameras

	FZ-SQ010F	FZ-SQ050F	FZ-SQ100F	FZ-SQ100N
Image elements	1/3-inch CMOS image elements			
Color/Monochrome	Color			
Effective pixels	752 (H) × 480 (V)			
Pixel size	6.0 (μm) × 6.0 (μm)			
Shutter function	1/250 to 1/32,258			
Partial function	8 to 752 lines			
Frame rate (image read time)	60 fps			
Field of vision	7.5 × 4.7 to 13 × 8.2 mm	13 × 8.2 to 53 × 33 mm	53 × 33 to 240 × 153 mm	29 × 18 to 300 × 191 mm
Installation distance	38 to 60 mm	56 to 215 mm	220 to 970 mm	32 to 380 mm
LED class	Class 2			
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C			
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
Weight	Approx. 150 g		Approx. 140 g	
Accessories	Mounting bracket (FQ-XL), polarizing filter attachment (FQ-XF1), instruction manual and warning label			

Intelligent Cameras, Autofocus Cameras

	FZ-SLC100	FZ-SLC15	FZ-SZC100	FZ-SZC15
Image elements	Interline transfer reading all pixels, 1/3-inch CCD image elements			
Color/Monochrome	Color			
Effective pixels	640 (H) × 480 (V)			
Pixel size	7.4 (μm) × 7.4 (μm)			
Shutter function	Electronic shutter; select shutter speeds from 1/10 to 1/50,000 s			
Partial function	12 to 480 lines			
Frame rate (image read time)	80 fps (12.5 ms)			
Field of vision[*1]	13 to 100 mm[*2]	2.9 to 14.9 mm[*2]	13 to 100 mm (See note1.)	2.9 to 14.9 mm (See note1.)
Installation distance	70 to 190 mm[*2]	35 to 55 mm[*2]	77.5 to 197.5 mm (See note1.)	47.5 to 67.5 mm
LED class (lighting)[*3]	Class 2		–	
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)			
Weight	Approx. 670 g	Approx. 700 g	Approx. 500 g	
Accessories	Instruction Sheet and hexagonal wrench			

[*1] The length of the visual field is the lengths along the Y axis.
[*2] Tolerance: ±5% max.
[*3] Applicable standards: IEC 60825-1: 1993 + A1: 1997 + A2-2001, EN 60825-1: 1994 + A1: 2002 + A2: 2001

LCD Monitor

	FZ-M08
Size	8.4 inches
Type	Liquid crystal color TFT
Resolution	1,024 × 768 dots
Input signal	Analog RGB video input, 1 channel
Power supply voltage	21.6 to 26.4 VDC
Current consumption	Approx. 0.7 A max.
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35 to 85% (with no condensation)
Weight	Approx. 1.2 kg
Accessories	Instruction Sheet and 4 mounting brackets

Camera Cables

	FZ-VS (2 m)	FZ-VSB (2 m)	FZ-VSL (2 m)
Shock resistiveness (durability)	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times		
Ambient temperature range	Operation and storage: 0 to +65°C (with no icing or condensation)		
Ambient humidity range	Operation and storage: 40 to 70%RH (with no condensation)		
Ambient atmosphere	No corrosive gases		
Material	Cable sheath, connector: PVC		
Minimum bending radius	69 mm	81 mm	69 mm
Weight	approx. 170 g	approx. 220 g	approx. 170 g

Monitor Cable

	FZ-VM
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times
Ambient temperature range	Operation: 0 to +50°C; Storage: -20 to +65°C (with no icing or condensation)
Ambient humidity range	Operation and storage: 35 to 85%RH (with no condensation)
Ambient atmosphere	No corrosive gases
Material	Cable sheath: heat-resistant PVC Connector: PVC
Minimum bending radius	75 mm
Weight	approx. 170 g

Halation Cut Illumination

General specifications

	FZ-SXC RB7018BR-4S	FZ-LTC RB7018BR-4S	FZ-LT RB7018BR-4S
Current consumption	18 W or less (12 VDC, 1.5 A max.) (including camera and strobe controller)		
Vibration resistance	10 to 150 Hz single amplitude 0.35 mm (maximum acceleration 50m/s^2) 3 directions, 8 strokes, 10 times		
Impact resistance	150m/s^2 6 directions, 3 times		
Ambient temperature	Operating: 0 to 50°C Storage: -25 to 60°C (with no icing or condensation)		
Ambient humidity	Operation and storage: 35 to 85%RH (with no condensation)		
Ambient atmosphere	No corrosive gases		
Protective structure	IEC60259 IP20		
Material	Case: zinc-coated steel plate Cover: acrylic board Clasp: stainless steel plate		
Weight including cables	Approx. 600 g	Approx. 500 g	Approx. 400 g

Cable Extension Unit

	FZ-VSJ
Power supply voltage*1	11.5 to 13.5 VDC
Current consumption*2	1.5 A max.
Ambient temperature range	Operating: 0 to 50°C Storage: -25 to 65°C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35 to 85% (with no condensation)
Maximum Units connectable	2 Units per Camera
Weight	Approx. 240 g
Accessories	Instruction Sheet and 4 mounting screws

*1 A power supply must be connected to the Strobe Controller and Camera when connecting a FZ-SLC100/SLC15/SZC100/SZC15 and using a Strobe Controller (3Z4S-LT MLEK-C100E1TS2.)

*2 The current consumption is when every Camera and Strobe Controller is connected to a power supply.

Long-distance Camera Cables

	FZ-VS2 (15 m)	FZ-VSL2 (15 m)
Shock resistiveness (durability)	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation and storage: 0 to +65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 40 to 70%RH (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath, connector: PVC	
Minimum bending radius	93 mm	
Weight	approx. 1600 g	

Parallel Cable

	FZ-VP	FZ-VPX
Vibration resistiveness	10 to 150 Hz single amplitude 0.15 mm 3 directions, 8 strokes, 4 times	
Ambient temperature range	Operation: 0 to +50°C; Storage: -20 to +65°C (with no icing or condensation)	
Ambient humidity range	Operation and storage: 35 to 85%RH (with no condensation)	
Ambient atmosphere	No corrosive gases	
Material	Cable sheath: heat-resistant PVC Connector: resin	
Minimum bending radius	75 mm	
Weight	approx.160 g	approx.180 g

Illumination specifications

	Specifications
Source	Blue LED (wavelength: Approx. 470 nm) Red LED (wavelength: 630 nma)
Illumination system	8 blocks luminous intensity variable illumination
Average lifetime	5,000 hours (Time it takes from manufacture for a 50% reduction in luminous intensity at an ambient temperature of 25°C, maximum brightness, and continuous illumination.)

Cameras / Cables Connection Table

Type of camera	Cable length	Intelligent cameras Autofocus cameras	High-speed cameras	Digital cameras			Small digital cameras	Intelligent compact cameras	Order code
				300,000-pixel	2 million-pixel	5 million-pixel	Pen type/ flat type		
Camera Cables Right-angle camera cables	2m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	FZ-VS FZ-VSL
	5m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	10m	No	Yes	Yes	Yes	No	Yes	Yes	
Bend resistant camera cables	2m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	FZ-VSB
	5m	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	10m	No	Yes	Yes	No	No	Yes	Yes	
Long-distance camera cable Long-distance right-angle camera cable	15m	No	Yes	Yes	Yes	No	Yes	Yes	FZ-VS2 FZ-VSL2

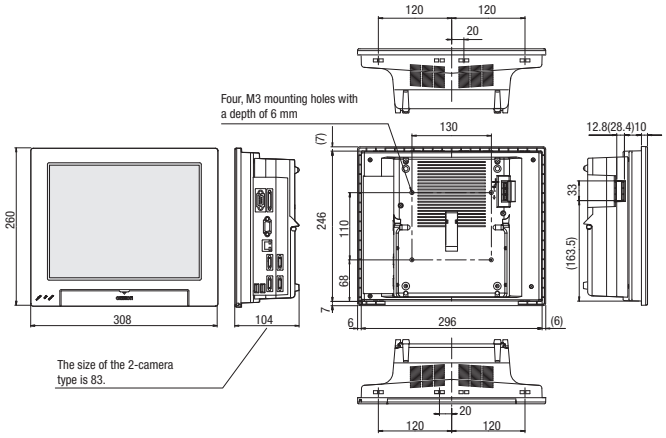
External Dimensions

(Unit: mm)

Controllers

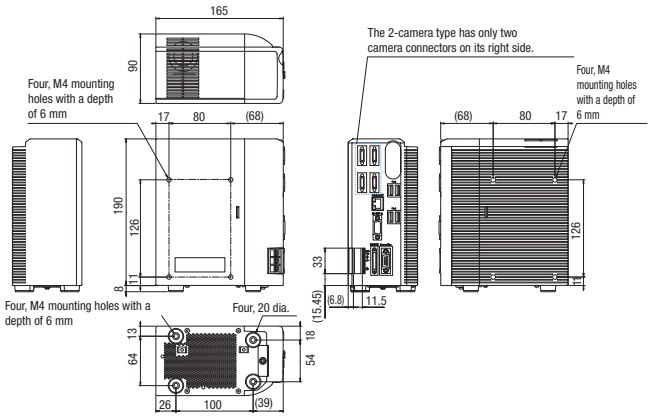
■ **LCD-integrated type**

FJ-300□/FJ-300□-10
FJ-H300□-E/FJ-H300□-10-E

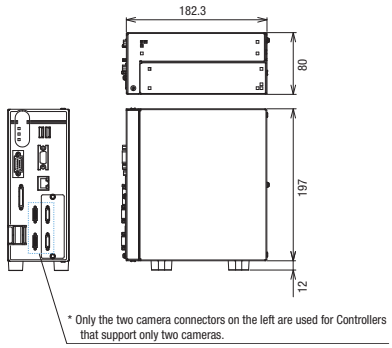


■ **Box-type**

FJ-305□/FJ-305□-10
FJ-H305□-E/FJ-H305□-10-E



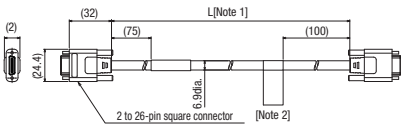
FJ-35□/FJ-35□-10



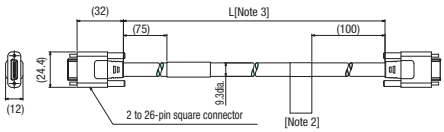
Cable

Camera Cable

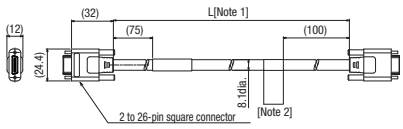
■ **Camera Cable(Model FZ-VS)**



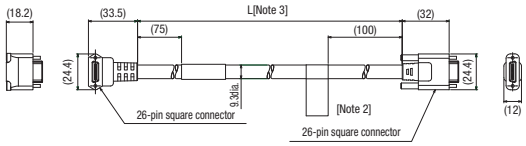
■ **Long-distance Camera Cable(Model FZ-VS2)**



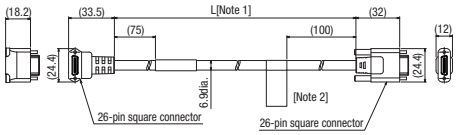
■ **Bend resistant Cable(Model FZ-VSB)**



■ **Long-distance Right-angle Camera Cable(Model FZ-VSL2)**



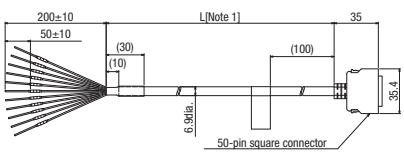
■ **Right-angle Camera Cable(Model FZ-VSL)**



[Note1]: cable is available in 2 m/5 m/10 m.
[Note2]: Each camera cables has polarity. Please ensure that the name plate side of the cable is connected to the controller.
[Note3]: cable is available in 15 m.

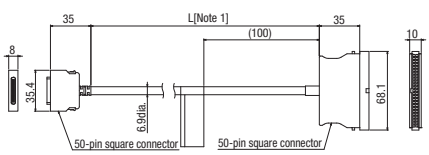
Parallel Cable(Model FZ-VP)

FZ-VP



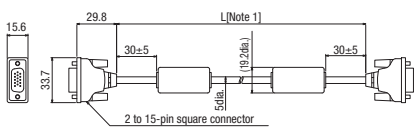
[Note1]: cable is available in 2 m/5 m.

FZ-VPX



[Note1]: cable is available in 2 m/5 m.

Monitor Cable(Model FZ-VM)

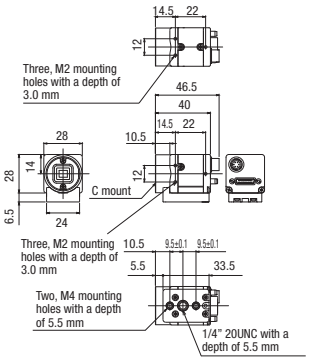


[Note1]: cable is available in 2 m/5 m.

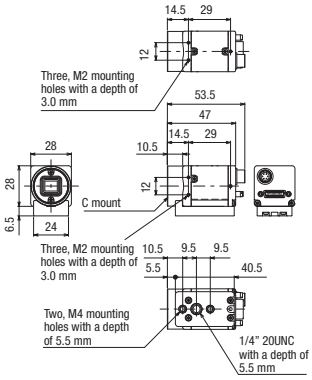
Cameras

■ Digital cameras

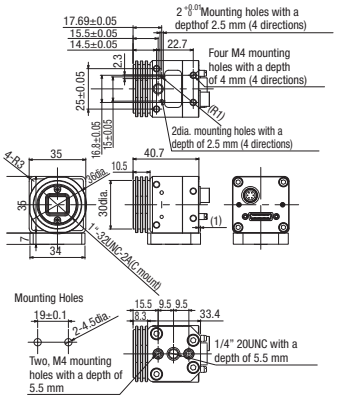
300,000-pixel camera
FZ-S
FZ-SC


Three, M2 mounting holes with a depth of 3.0 mm
C mount
Three, M2 mounting holes with a depth of 3.0 mm
Two, M4 mounting holes with a depth of 5.5 mm
1/4" 20UNC with a depth of 5.5 mm

2 million-pixel camera
FZ-S2M
FZ-SC2M

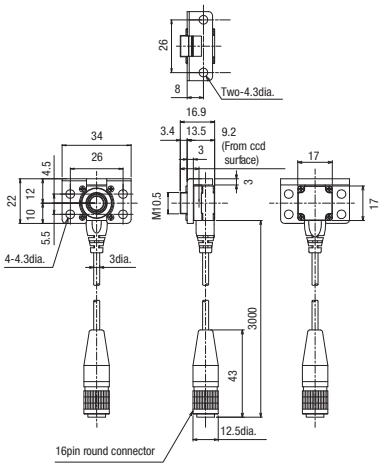

Three, M2 mounting holes with a depth of 3.0 mm
C mount
Three, M2 mounting holes with a depth of 3.0 mm
Two, M4 mounting holes with a depth of 5.5 mm
1/4" 20UNC with a depth of 5.5 mm

5 million-pixel camera
FZ-S5M2
FZ-SC5M2

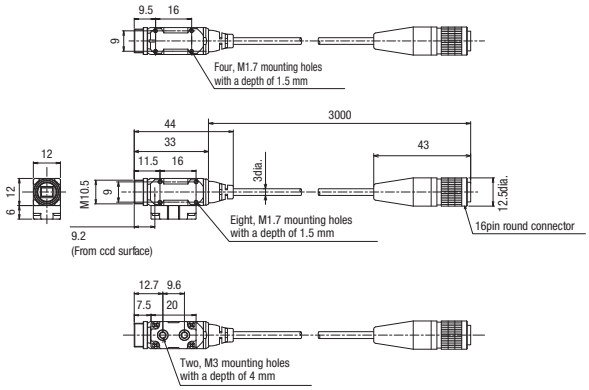

Four M4 mounting holes with a depth of 4 mm (4 directions)
2dia. mounting holes with a depth of 2.5 mm (4 directions)
C-mount
Mounting Holes
Two, M4 mounting holes with a depth of 5.5 mm
1/4" 20UNC with a depth of 5.5 mm

■ Small digital cameras

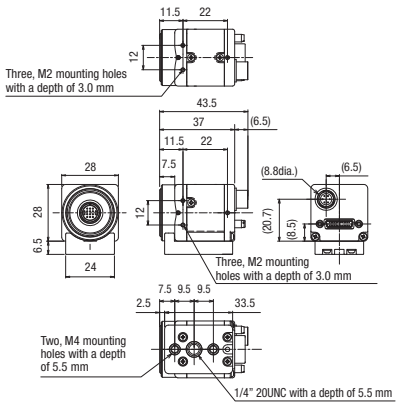
Camera head
Flat camera
FZ-SF
FZ-SFC



Pen-shaped camera
FZ-SP
FZ-SPC

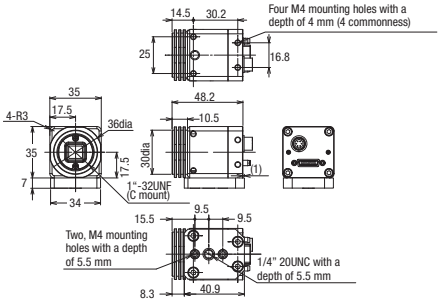

Four, M1.7 mounting holes with a depth of 1.5 mm
Eight, M1.7 mounting holes with a depth of 1.5 mm
16pin round connector
(From ccd surface)
Two, M3 mounting holes with a depth of 4 mm

Camera amplifier
Can be used for both flat cameras and pen-shaped cameras


Three, M2 mounting holes with a depth of 3.0 mm
Three, M2 mounting holes with a depth of 3.0 mm
Two, M4 mounting holes with a depth of 5.5 mm
1/4" 20UNC with a depth of 5.5 mm

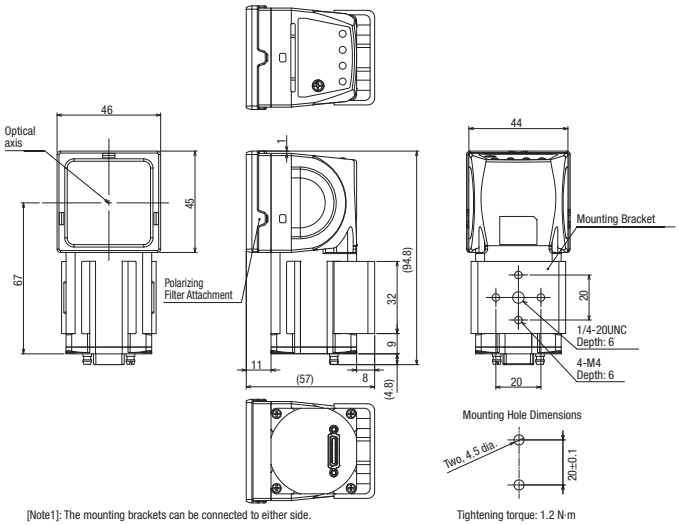
■ High speed camera

FZ-SHC
FZ-SH


Four M4 mounting holes with a depth of 4 mm (4 commonness)
C mount
Two, M4 mounting holes with a depth of 5.5 mm
1/4" 20UNC with a depth of 5.5 mm

Intelligent Compact Cameras

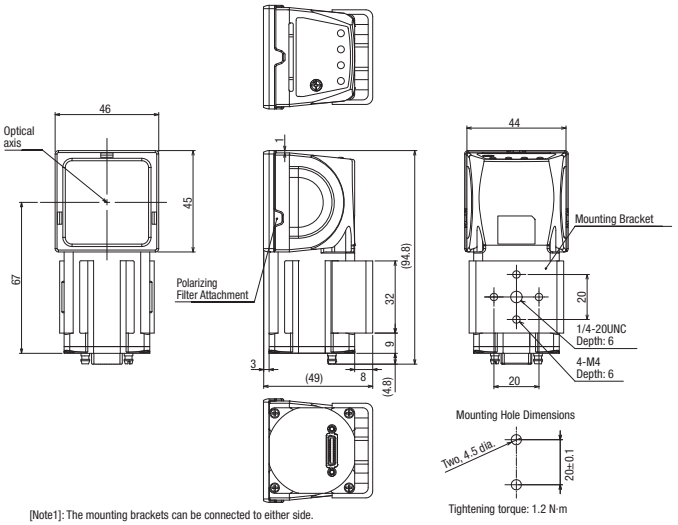
Narrow view/Standard
FZ-SQ010F
FZ-SQ050F



[Note1]: The mounting brackets can be connected to either side.

Tightening torque: 1.2 N·m

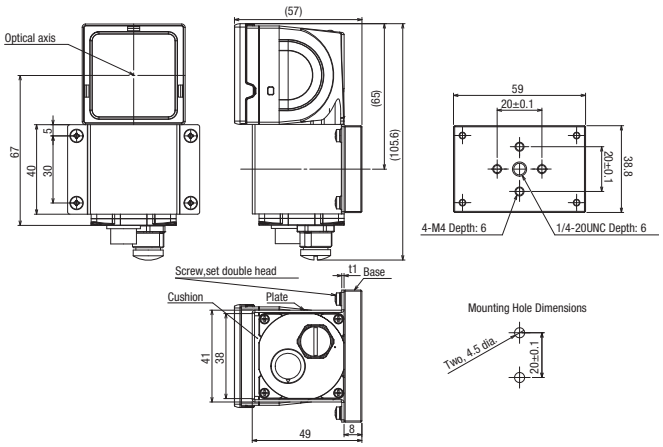
Wide View
FZ-SQ100F (long-distance)
FZ-SQ100N (short-distance)



[Note1]: The mounting brackets can be connected to either side.

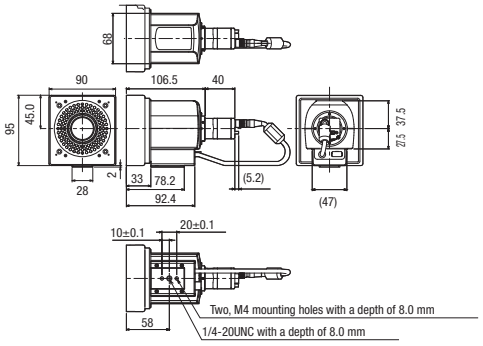
Tightening torque: 1.2 N·m

See the diagram below when mounting bracket FQ-XL2 is attached.

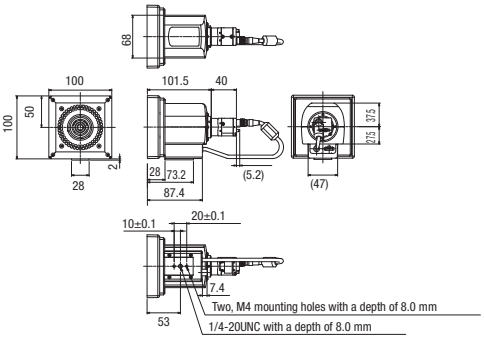


Intelligent camera

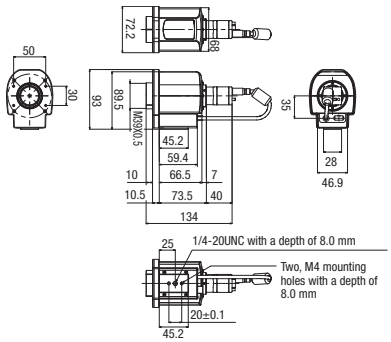
FZ-SLC15



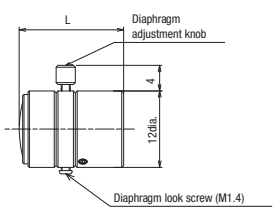
FZ-SLC100



■ Auto focus camera
FZ-SZC15
FZ-SZC100

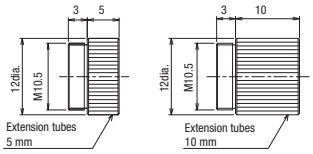


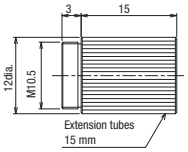
Lens for small camera
FZ-LES Series



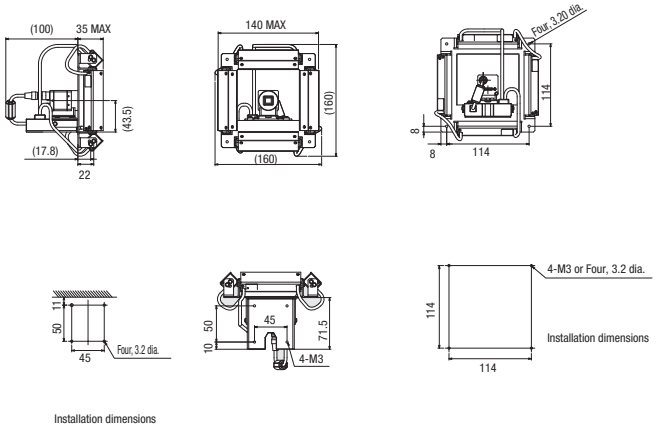
Lenses Model	Focal length	Brightness	Maximum outside diameter	Overall length
FZ-LES3	3 mm	F2.0	12 dia.	16.4 mm
FZ-LES6	6 mm	F2.0	12 dia.	19.7 mm
FZ-LES16	16 mm	F3.4	12 dia.	23.1 mm
FZ-LES30	30 mm	F3.4	12 dia.	25.5 mm

Extension Tubes for small camera
FZ-LESR



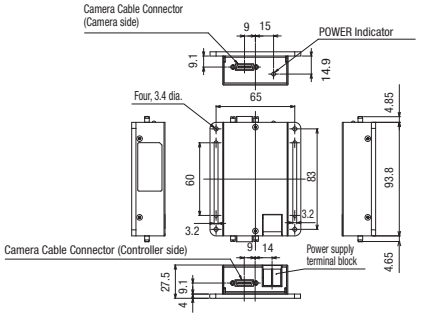


Special Halation-cutoff Lamp
FZ-SXCRB7018BR-4S (camera-integrated type)

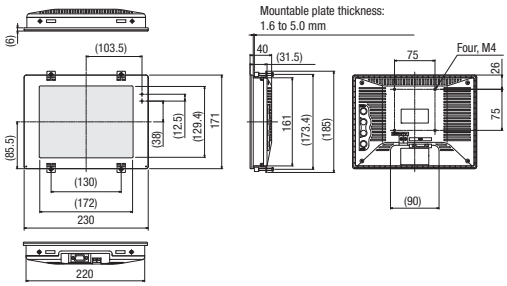


Installation dimensions

Camera Cable Extension Unit
FZ-VSJ

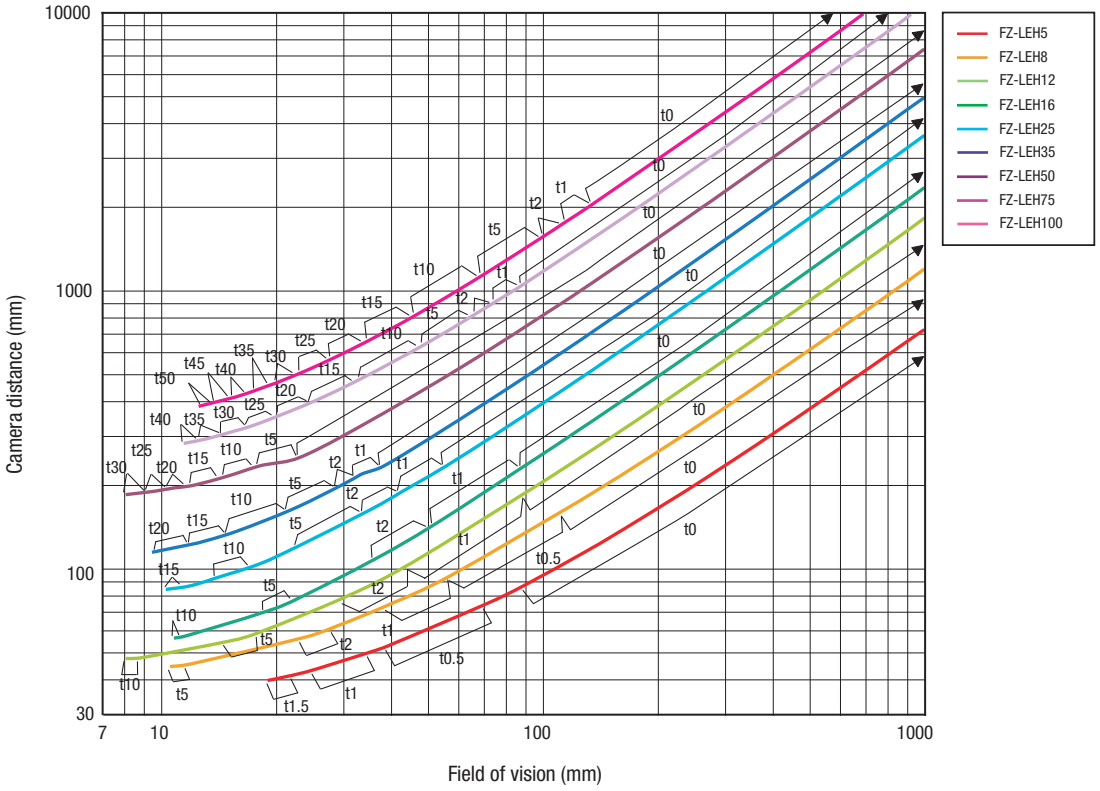


LCD Monitor
FZ-M08



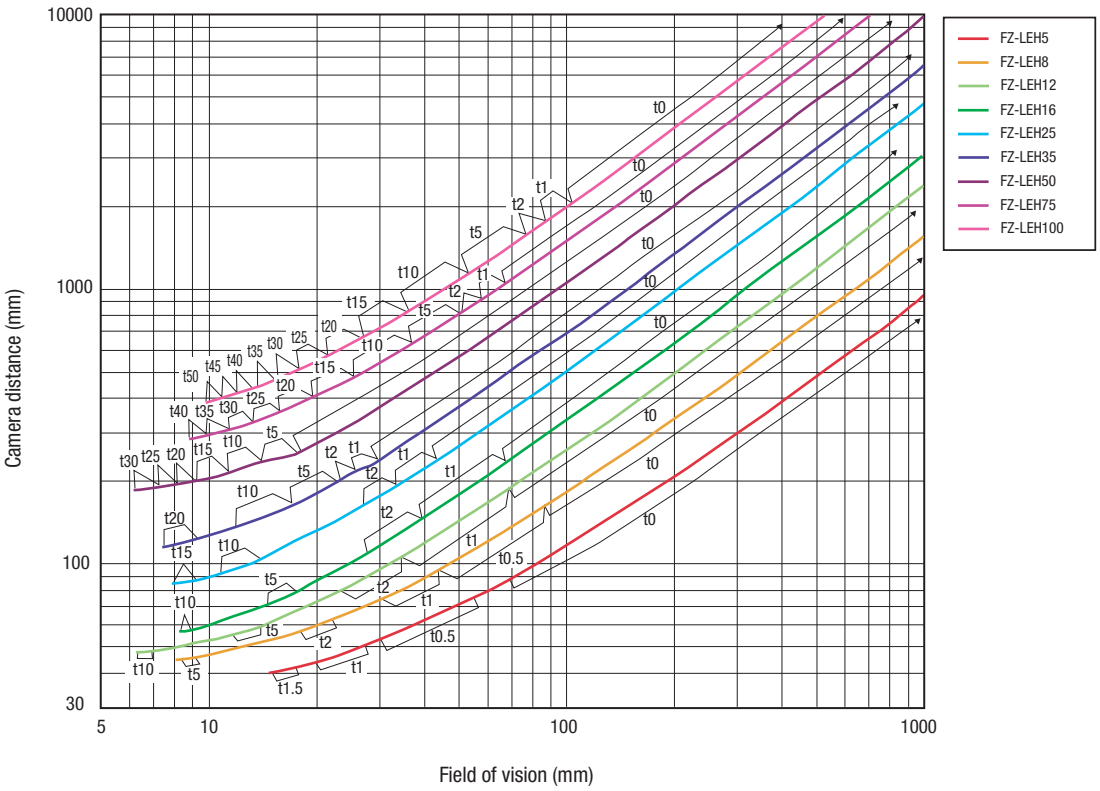
Optical Chart

5 million-pixel digital camera FZ-S□5M2



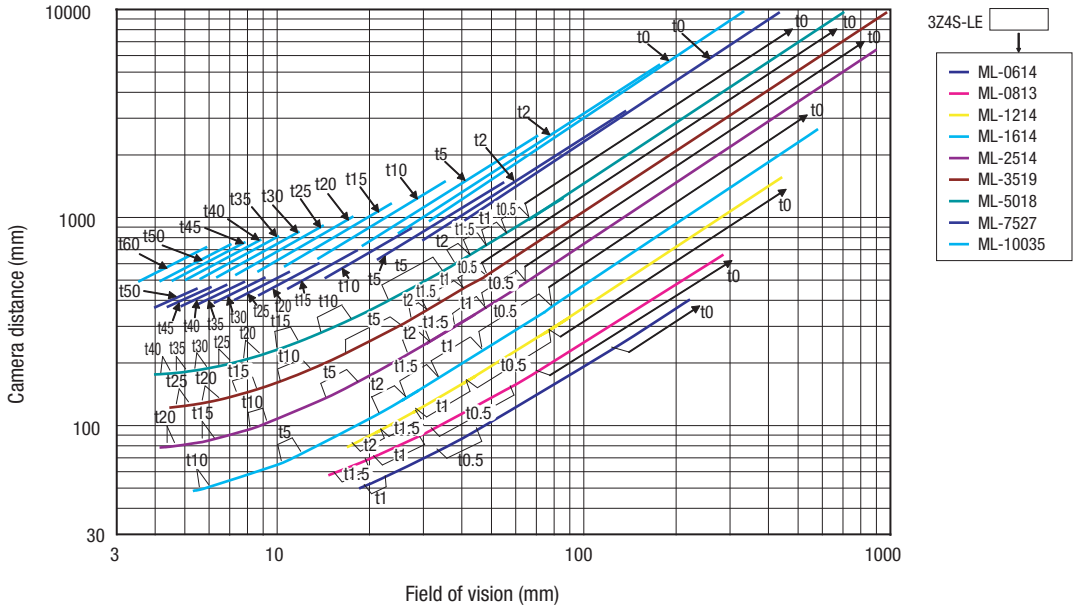
The 5-mm Extension Tubes (3Z4S-LE ML-EXR) cannot be used with FZ-LEH25 Lenses.

2 million-pixel digital camera FZ-S□2M

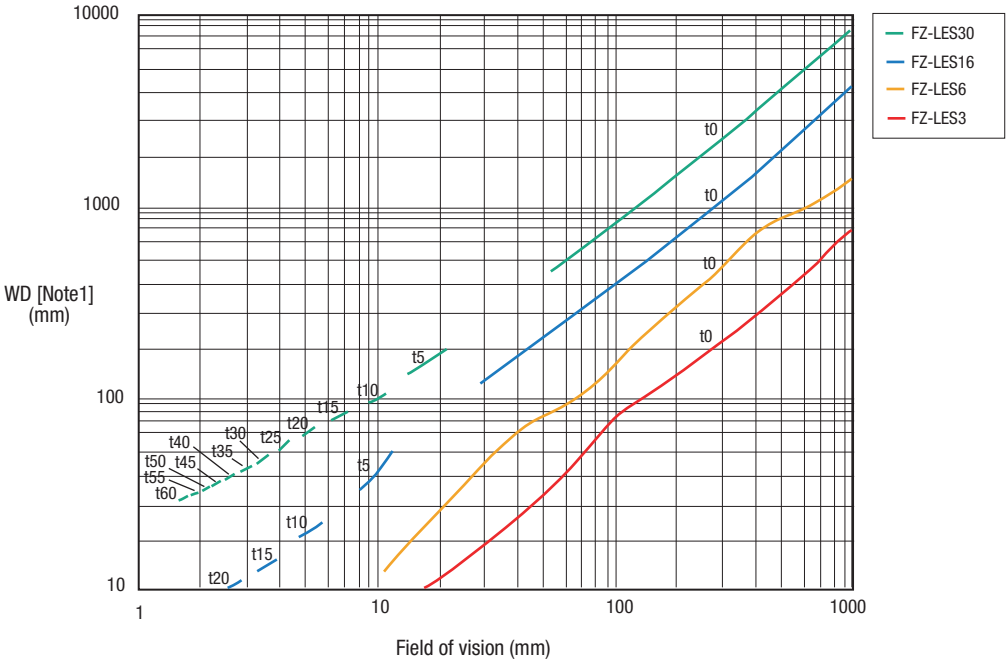


The 5-mm Extension Tubes (3Z4S-LE ML-EXR) cannot be used with FZ-LEH25 Lenses.

300,000-pixel High-speed camera FZ-SH□, and Digital camera FZ-S□



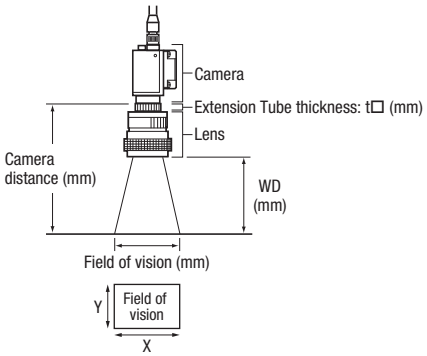
300,000-pixel small digital cameras FZ-SF□, FZ-SP□



Note: 1. The vertical axis represents WD, not installation distance.

■ Meaning of Optical Chart

The X axis of the optical chart shows the field of vision (mm)*1, and the Y axis of the optical chart shows the camera installation distance (mm)*2.



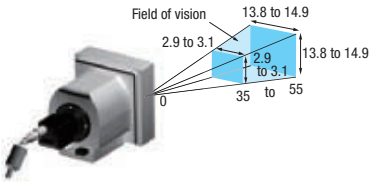
*1 The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
*2 The vertical axis represents WD for small cameras.

Intelligent Cameras, Autofocus Cameras

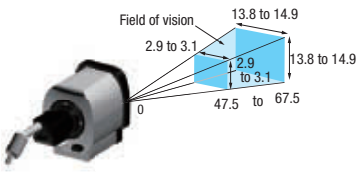
■ Narrow View

(Unit: mm)

FZ-SLC15

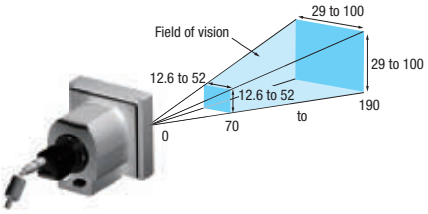


FZ-SZC15

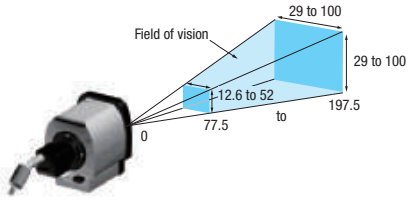


■ Wide View

FZ-SLC100



FZ-SZC100



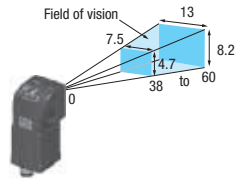
* Field of Vision of Intelligent Cameras and Autofocus Cameras

The images displayed on the monitor will be rectangular images of 640×480 pixels.
The valid processing area for measurements is the 480×480-pixel area in the middle.
The above figures show the dimensions of the middle 480×480 pixels.

Intelligent Compact Cameras

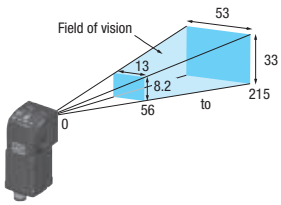
■ Narrow View

FZ-SQ010F



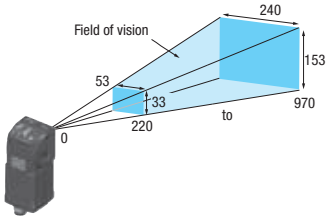
■ Standard

FZ-SQ050F



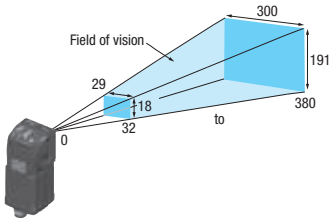
■ Wide View (Long-distance)

FZ-SQ100F



■ Wide View (Short-distance)

FZ-SQ100N



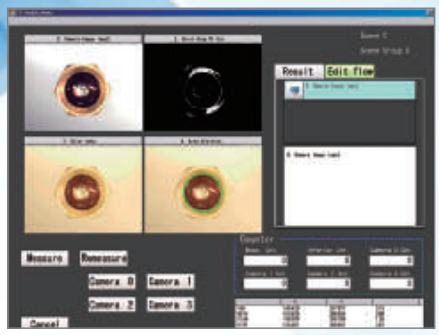
VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect vision platform

FlexXpect is a modular Vision platform featuring industry specific functionality. In combination with the powerful Xpectia-hardware, the FlexXpect software modules take you into a new dimension of specialisation. FlexXpect is simple to use and can be customised easily, to focus on your individual needs. The combination of Xpectia's real colour sensing, high resolution and intuitive user guidance combined with the FlexXpect value added tools represents an unbeatable duo.

Depending on industry, different requirements and regulations are in place for quality inspection. Premium class add-on functionality, tailored for industry, is delivered by FlexXpect.

FlexXpect



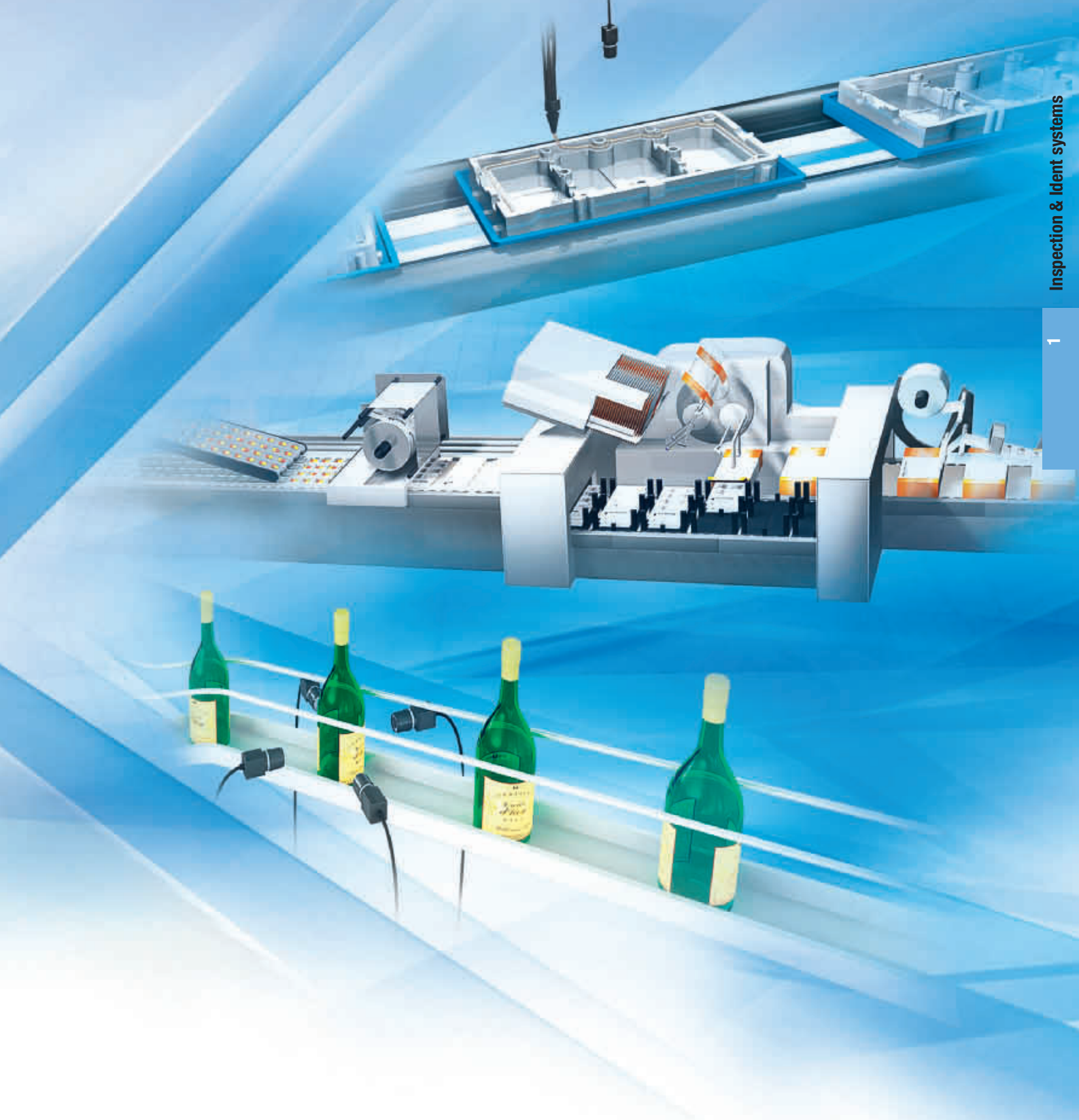
Simplicity – easy to use

FlexXpect features an easy and intuitive user interface, which allows inspection solutions to be set-up quickly and efficiently. With a built in touch screen interface and icon based menu structure, the complexity of programming the system is kept to a minimum. The Flow-Menu is an ideal tool to re-built the process sequences inside the vision platform.

Customised to your needs

The FlexXpect platform can be further customized to the needs of the individual application. Different levels of product modifications are supported. Based on the skill of the user and required functionality it offers:

- Flow programming
- GUI modifications
- Processing items & communication



YOUR BENEFITS

- FlexXpect-Glue Bead: Automatic one shot seal inspection
- FlexXpect-Pharma: 21 CFR Part 11 compliant
- FlexXpect-Labelling: 360° bottle inspection
- FlexXpect-PV: alignment & inspection of wafers

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect Pharma

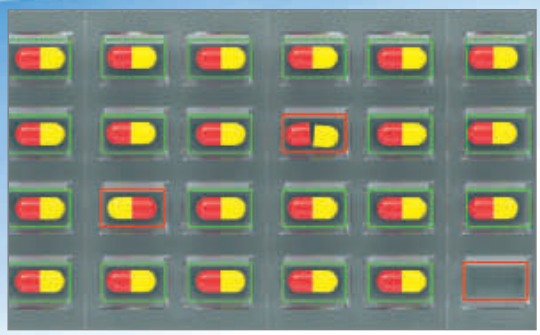
FlexXpect is a modular Vision platform. In combination with the powerful Xpectia-hardware, it takes you into a new dimension of specialisation. The FlexXpect-Pharma is targeting challenging inspections in the Pharmaceutical industry. It offers powerful inspection tools and all functions, necessary for the validation under the FDA 21 CFR Part 11. With the powerful code verification and OCR features, FlexXpect-Pharma is the ideal solution for Track & Trace applications.

Inspect any applications in Pharma:

- Blister pack
- Vials
- Syringes
- Label inspection

FlexXpect Pharma

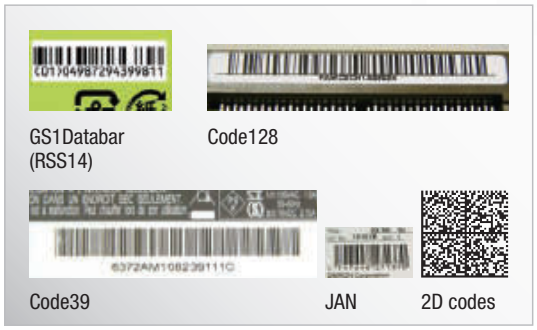
Inspect any applications in Pharma



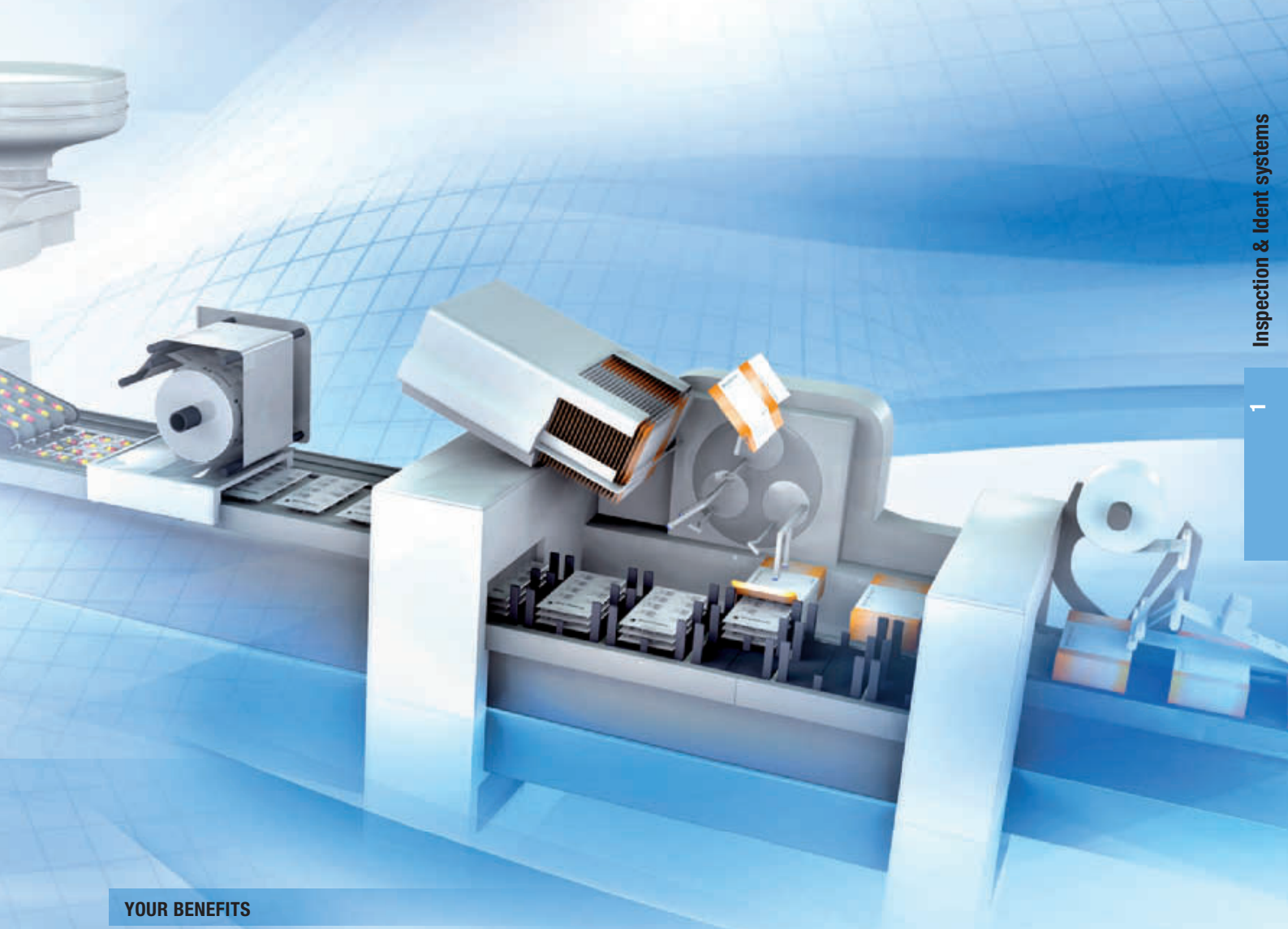
Pill inspection in blisters

Polar transformation of round strings

Date/Batch code verification (OCR/OCV)



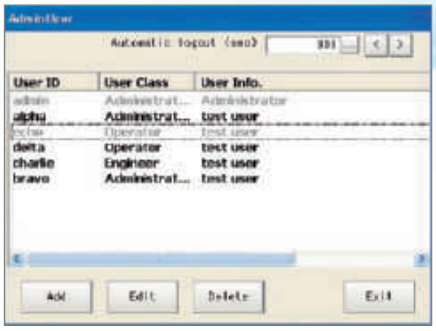
High speed code reading



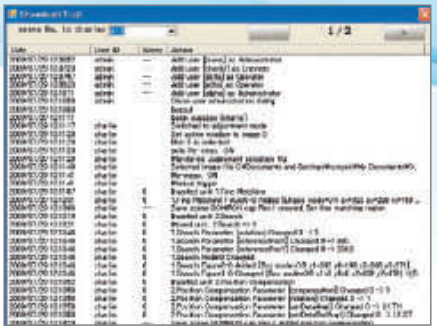
YOUR BENEFITS

- Strong OCR/OCV (any font & print type)
- Barcode/Datamatrix
- Braille
- Pattern and edge tools
- Real colour inspection
- High resolution to detect minute defects

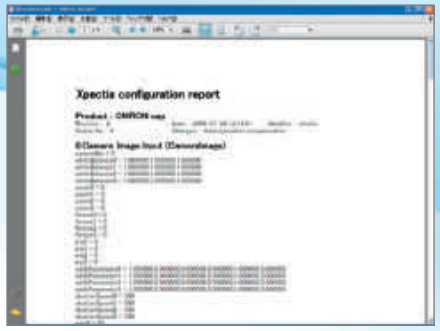
Optimize your set-up with a click



User access administration



Audit trail



Generate and export configuration data

FlexXpect-Pharma software module	FLEXXPECT-PHARMA

Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect Labelling

FlexXpect is a modular Vision platform. In combination with the powerful Xpectia-hardware, it takes you into a new dimension of specialisation. FlexXpect-Labelling has been designed to deliver tailored functionality for inspection of labels and packages.

Powerful image processing tools for labelling:

- OCR/OCV
- Barcode/Datamatrix
- Pattern and edge tools
- Real colour inspection
- High resolution to detect minute defects

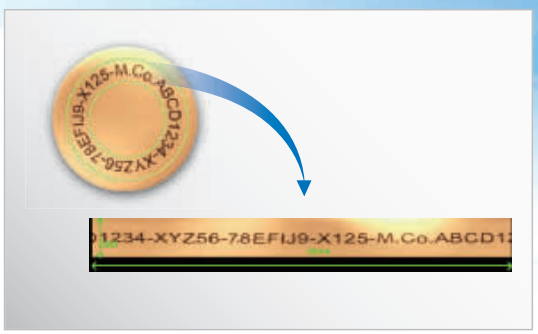
Label unwrapping from bottles for inspection of premium beverages:

- Acquire images from up to 4x cameras
- Compensate the distortion
- Identify the overlapping areas
- Stitch the images together

FlexXpect Labelling

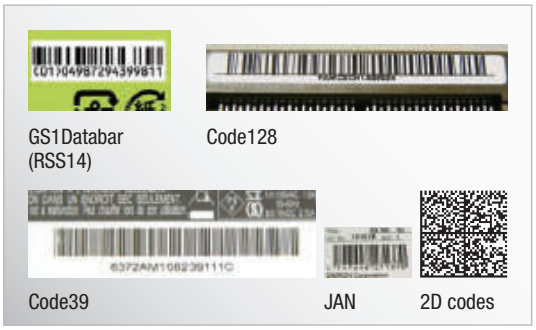
Powerful image processing tools for labelling

Strong OCR/OCV



Polar transformation of round strings

Date/Batch code verification (OCR/OCV)



High speed code reading

Position and defect inspection

Produce aesthetically perfect products is a key point. FlexXpect-Labelling offers a suite of image processing tools to inspect the label for position and defects.

Reading different codes at a time

Two or more different codes in the same field of view can be read by utilizing a high resolution camera.This function helps to reduce the inspection time.

YOUR BENEFITS

- Strong OCR/OCV
- Code reading (Barcode, Datamatrix)
- 360° inspections of bottles
- Real colour processing items
- High resolution
- Easy & intuitive configuration

FlexXpect-Labelling software module	FLEXXPECT-LABELLING

Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect Glue Bead

FlexXpect is a modular Vision platform. In combination with the powerful Xpectia-hardware, it takes you into a new dimension of specialisation. The FlexXpect-Glue Bead inspects the complete sealing of automotive parts in one shot. Driven by the real colour functionality, any sealing can be identified and checked, independent how visible it is. Featuring a simple set-up procedure and automatic calculation of the path, it represents a powerful and straight forward solution for any glue application.

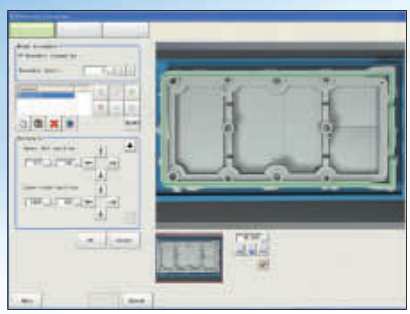
Glue Bead inspection:

- Correct path
- Thickness
- Interrupt

FlexXpect Glue Bead

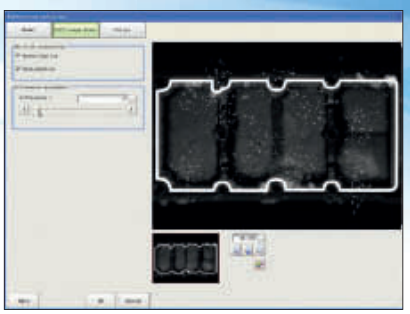
Inspect any applications in Pharma

FlexXpect-Glue Bead features an intuitive and easy set-up procedure. No expert knowledge of the user is required.



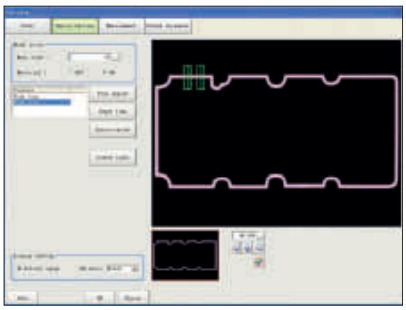
Step 1

Define inspection area.



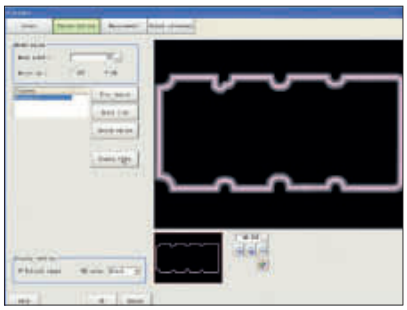
Step 2

Teach the glue.



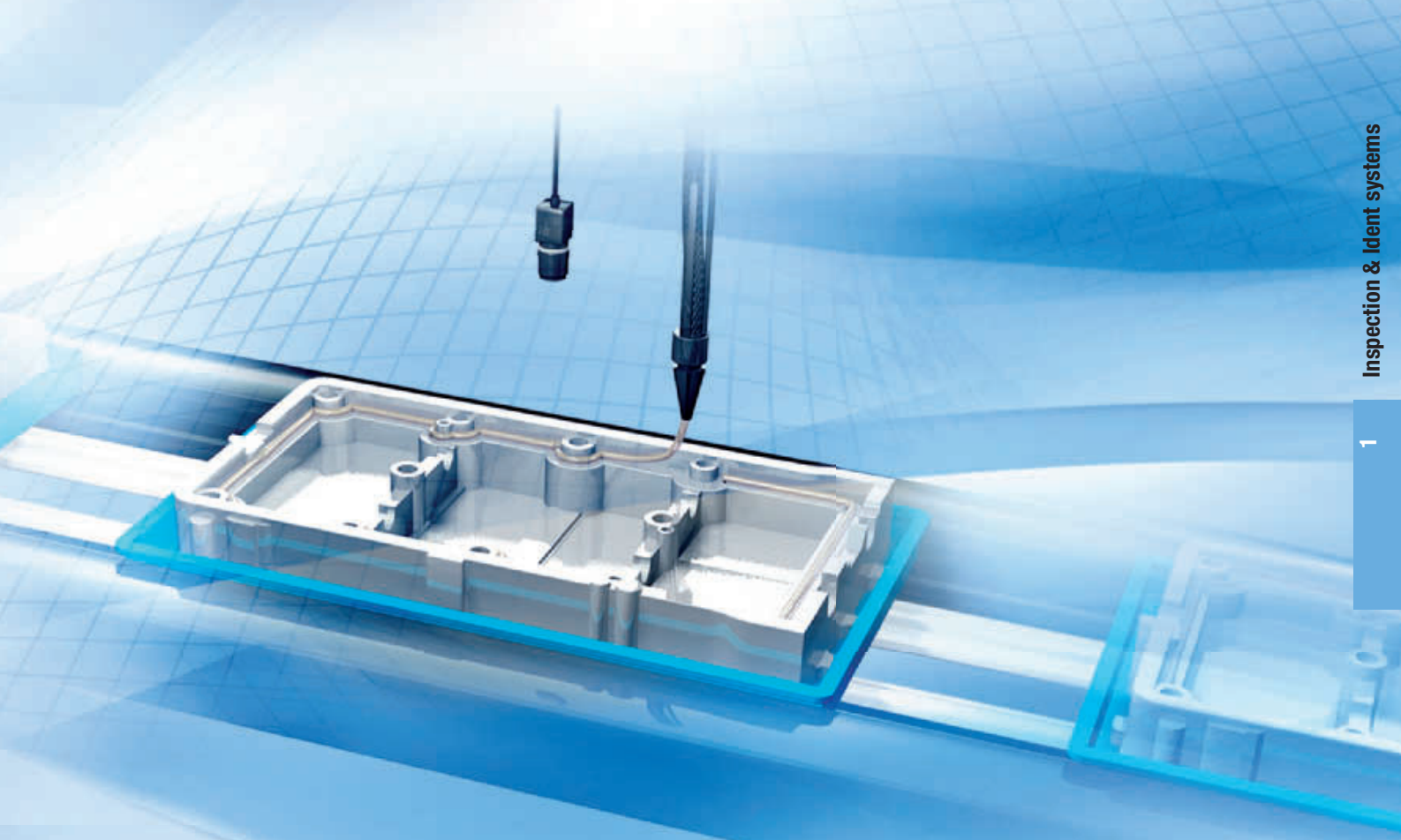
Step 3

Define start & end point of the glue.



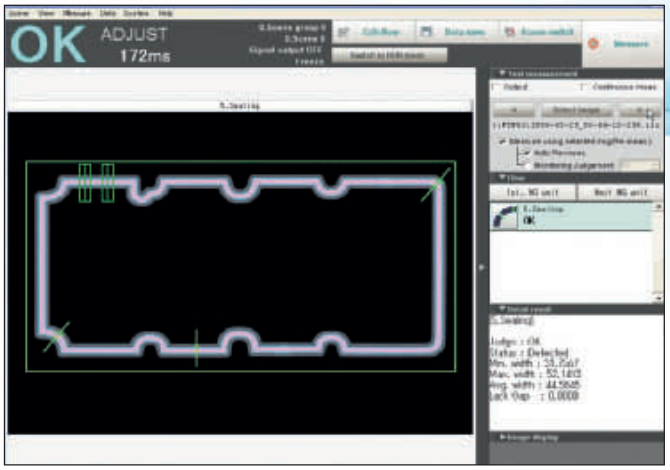
Step 4

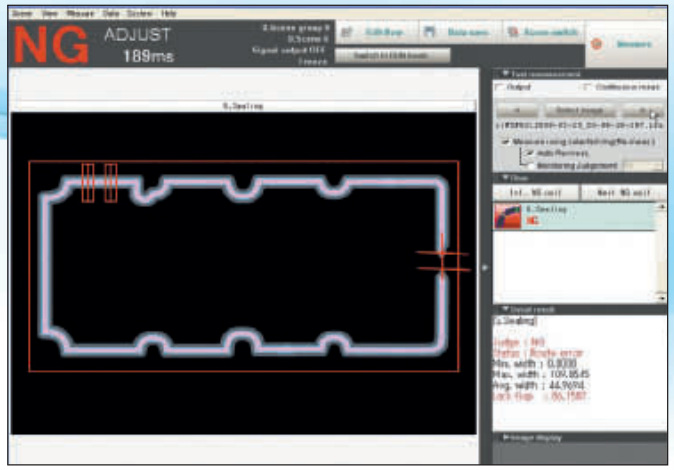
Automatic calculation of the path of the Glue Bead.



YOUR BENEFITS

- One shot inspection of the complete path
- Easy set-up
- Automatic path calculation
- Real colour glue extraction





FlexXpect-Glue Bead software module	FLEXXPECT-GLUE BEAD

Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

VISION – TAILORED AND FIT FOR INDUSTRY

FlexXpect PV

FlexXpect is a modular Vision platform. In combination with the powerful Xpectia hardware, it takes you into a new dimension of specialisation. FlexXpect-PV delivers tailored functionality for alignment and the inspection of wafers for chips and cracks.

Feautures of FlexXpect-PV:

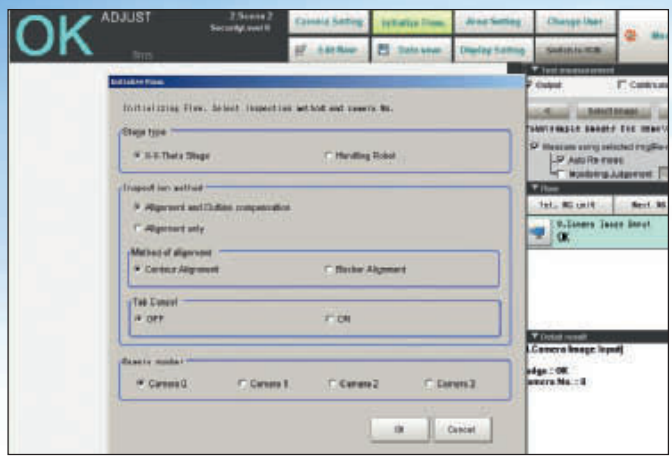
- Easy and intuitive set-up
- Automatic extraction and teaching of the PV wafer
- Precise inspections with high resolution cameras
- Automatic robot calibration
- Fade-out strings and conveyor belts

Supported PV inspections:

- Precise wafer and string alignment
- Accurate chamfer chip inspection
- Detection of minute edge cracks
- Bus bar alignment on the wafer

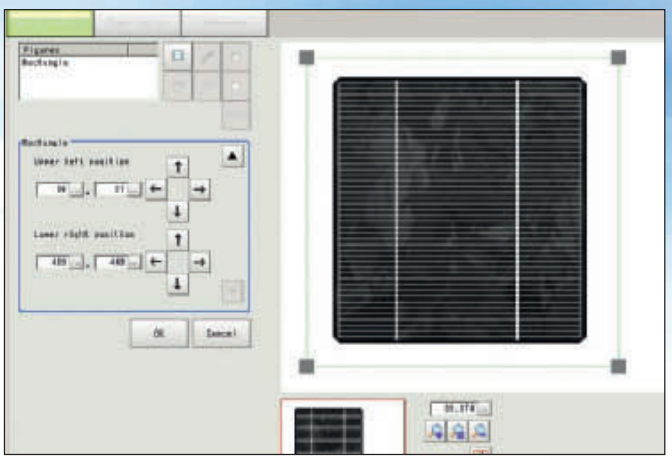
FlexXpect PV

Quick set-up in simple steps:



Step 1:

Select the inspection function



Step 2:

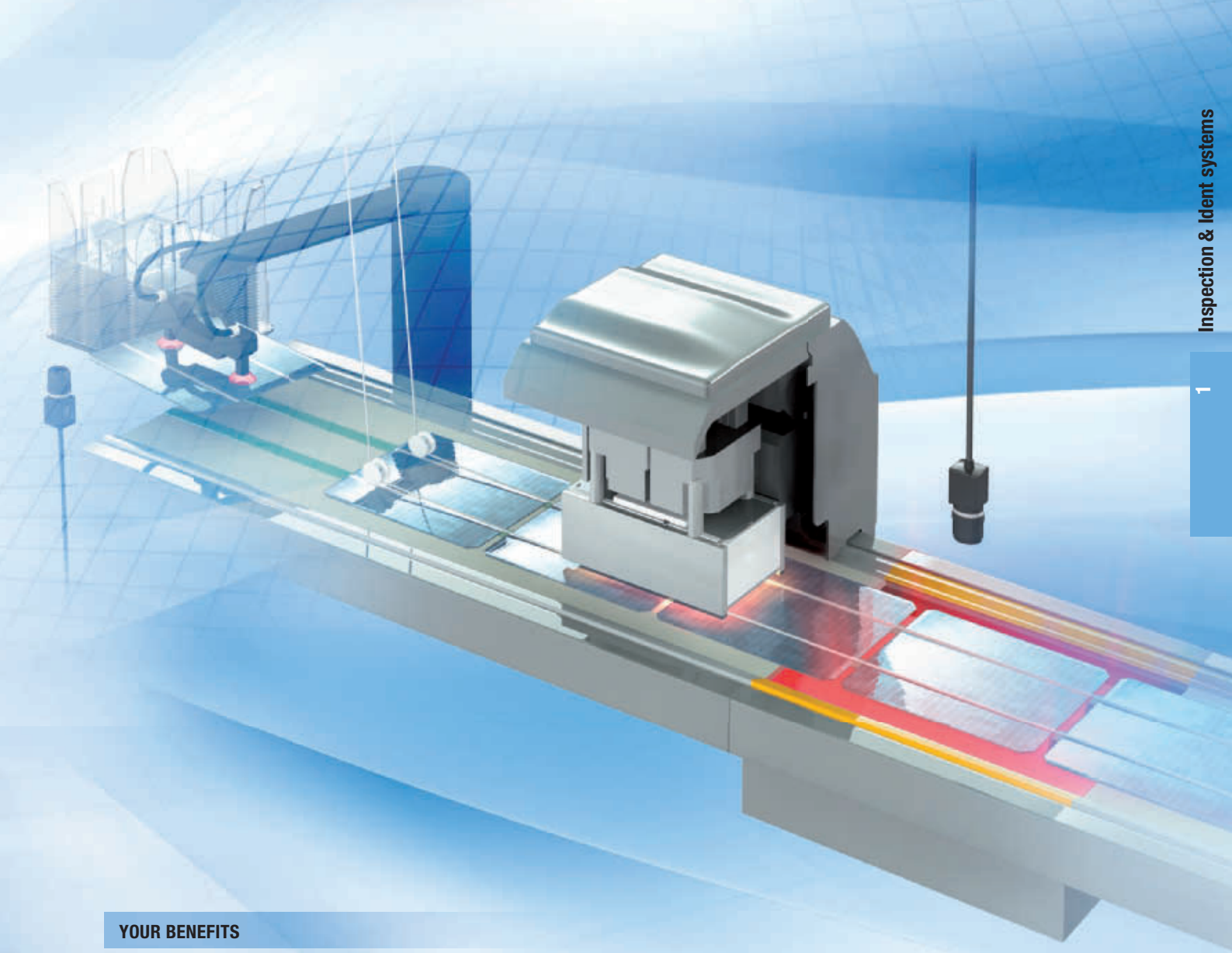
Draw a rectangle around the wafer

Step 3:

One step deletion of bus bars and conveyor belts (optional)

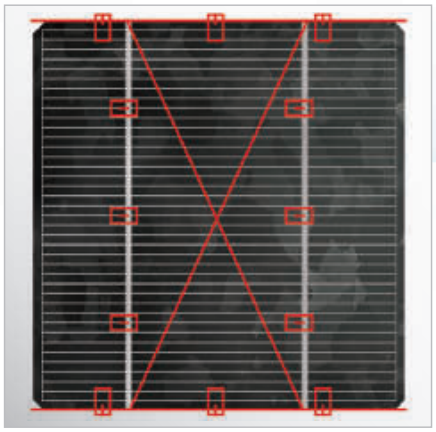
Step 4:

Start the inspection
Accurate chamfer chip inspection (0.1 mm)

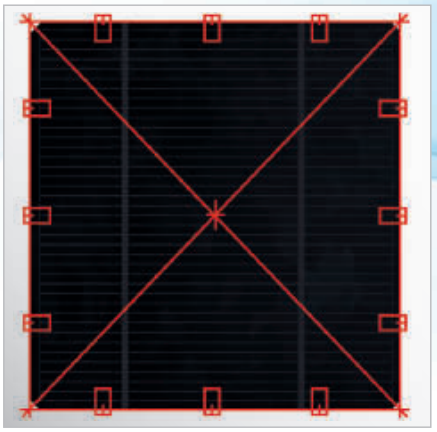


YOUR BENEFITS

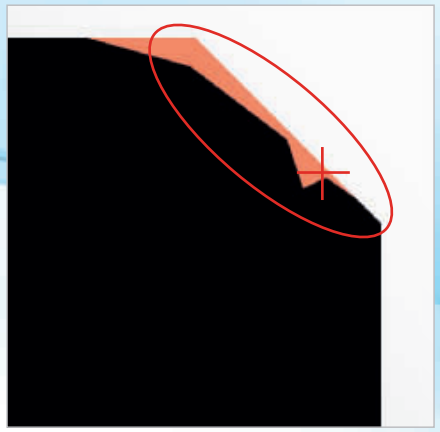
- One shot inspection of the complete path
- Easy set-up
- Automatic path calculation
- Real colour glue extraction



Bus bar alignment



Outline adge alignment



Precise detection of edge breakage

FlexXpect-PV software module	FLEXXPECT-PV

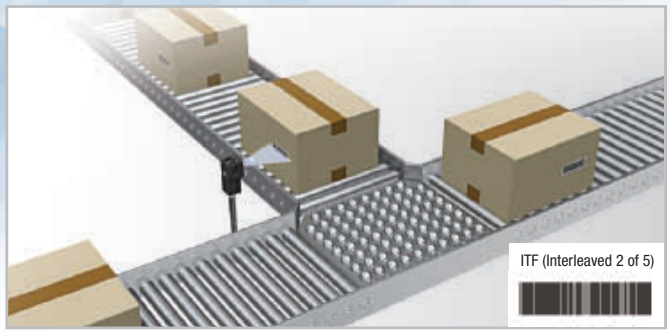
Note: FlexXpect software modules require Xpectia/FZW hardware. This is not part of the item and needs to be ordered independently.

CODE READERS

All codes with one touch

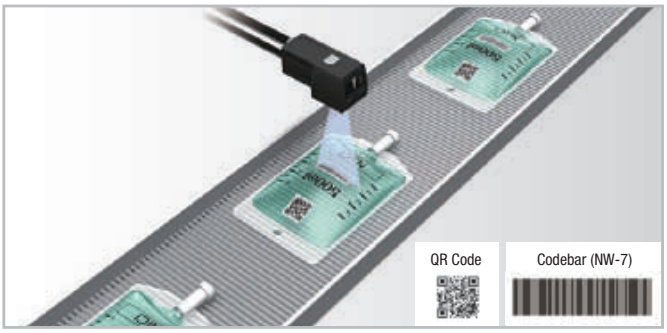
The new compact FQ-CR1 code reader from Omron enables accurate, reliable and easy reading of barcodes and 2D codes, thanks to superior crystal clear imaging technology, which it shares with the other products in Omron's highly regarded FQ family of vision sensors.

Paper or Cardboard

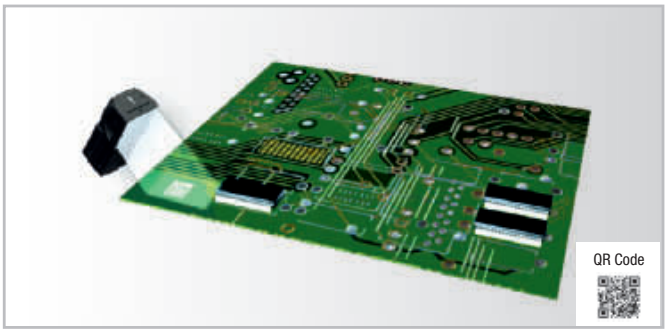


PET Bottles

Medical Packs



PCB Boards



Compact and robust

Designed specifically for reading codes printed on paper or labels, the FQ-CR1 features integrated high power LED lighting and HDR imaging technology, enabling it to provide dependable code reading even in challenging applications. It also automatically recognizes nine different barcode formats and eight different 2D code formats without the need for setting, making it exceptionally versatile and simple to configure.

YOUR BENEFITS

- 1D code reader
- 2D code reader
- Crystal-clear image quality
- One-touch control via simple, icon-driven menu

Guided by simplicity

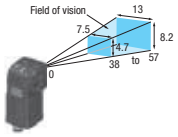
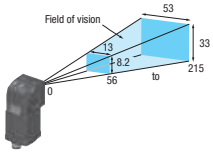
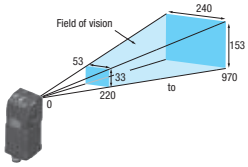
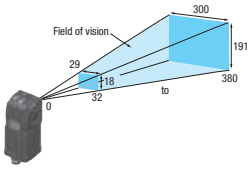
Setting up the new FQ-CR1 can be carried out using a PC-based software package or by using the optional handheld Touchfinder screen. Ideal for making set up changes on site, the Touchfinder screen features a convenient and intuitive “teaching” system – the user simply places a sample code in the field of view of the reader, confirms it using the Touchfinder screen, and the code reader automatically adjusts itself for optimum performance.

All codes with one touch

The new compact FQ-CR1 code reader enables accurate, reliable and easy reading of barcodes and 2D codes, thanks to superior crystal clear imaging technology, which it shares with the other products in our highly regarded FQ family of vision sensors.

- 1D code reader
- 2D code reader
- Crystal-clear image quality
- One-touch control via simple, icon-driven menu

Ordering information

Type	Narrow view	Standard view	Wide view	
			(Long-distance)	(Short-distance)
				
NPN	FQ-CR10010F	FQ-CR10050F	FQ-CR10100F	FQ-CR10100N
PNP	FQ-CR15010F	FQ-CR15050F	FQ-CR15100F	FQ-CR15100N

Touch Finder

Type	Order code
DC power supply	FQ-D30
AC/DC/battery	FQ-D31*1

*1 AC Adapter and Battery are sold separately.

Cables

Type	Cable length	Order code
FQ Ethernet Cables (connect Code Reader to Touch Finder, Code Reader to PC)	2 m	FQ-WN002
	10 m	FQ-WN010
	20 m	FQ-WN020
I/O Cables	2 m	FQ-WD002
	10 m	FQ-WD010
	20 m	FQ-WD020

2D codes

Data Matrix	QR Code	Micro QR Code
PDF417	Micro PDF417	Maxi Code
Aztec Code	Codablock	

Barcodes

JAN/EAN/UPC	Code39	Codabar (NW-7)
ITF (Interleaved 2 of 5)	Code93	Code128/GS1-128
GS1-DataBar	GS1-128 Composite Code	Pharmacode

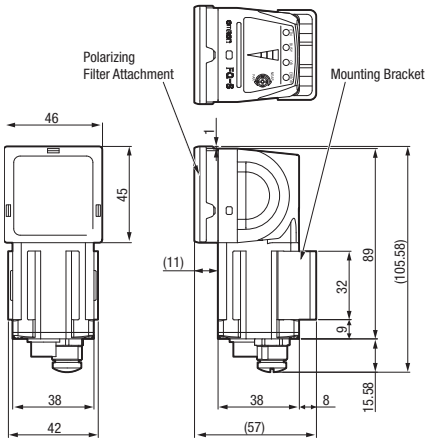
Specifications

Item		Descriptions
Model	NPN	FQ-CR10□□□□
	PNP	FQ-CR15□□□□
Field of vision		Refer to the table above
Installation distance		
Minimum resolution		FQ-CR1□010F: 0.040 mm FQ-CR1□050F: 0.070 mm FQ-CR1□100F: 0.282 mm FQ-CR1□100N: 0.155 mm
Main functions	Code	2D Code (DataMatrix (EC200), QR Code, MicroQR Code, PDF417, MicroPDF417, Maxi Code, Aztec Code and Codablock)
		Bar code (JAN/EAN/UPC, Code39, Codabar (NW-7), ITF (Interleaved 2 of 5), Code 93, Code128/GS1-128, GS1 DataBar* (Truncated, Stacked, Omni-directional, Stacked Omni-directional, Limited, Expanded and Expanded Stacked), Pharmacode and GS1-128 Composite Code (CC-A, CC-B, CC-C))
	Image filter	None
	Verification function	Supported
	Number of simultaneous inspections	32
	Number of registered scenes	32
Image input	Image filter	Real color, high dynamic range (HDR), polarizing filter (attachment), white balance
	Image elements	1/3-inch color CMOS
	Shutter	1/250 to 1/30,000
	Processing resolution	752 × 480
Lighting	Lighting method	Pulse
	Lighting color	White
	LED class*1	Class 2
Data logging	Measurement data	In Code Reader: 1,000 items (If a Touch Finder is used, results can be saved up to the capacity of an SD card.)
	Images	In Code Reader: 20 images (If a Touch Finder is used, images can be saved up to the capacity of an SD card.)
Auxiliary function		Math (arithmetic, calculation function, trigonometric functions and logic functions
Measurement trigger		External trigger (single or continuous)

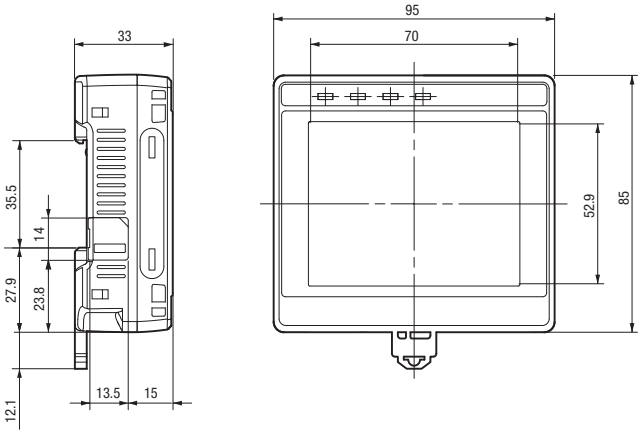
*1 Applicable standards: JIS C 6802:2005

Dimensions

FQ-CR1



Touch Finder



Target, “touch&go”

- Easy to use – target, “touch&go”
- Build-in LCD monitor for immediate display of results
- Accurate – reading of direct print marks
- Variable field of view

Ordering information

Main unit

Name	Communications interface	Field of vision	Remarks	Order code
2D code reader	RS-232C	5x5 to 10x10 mm	–	V400-H111
	RS-232C	15x15 to 30x30 mm	–	V400-H211

Accessories

Name	Cable length	Remarks	Order code
Contactor	–	Contactor for positioning (detachable)	V400-AC2
Communications cable	2 m	For SYSMAC series connection (with power cord)	V400-W20-2M
	5 m		V400-W20-5M
	2 m	For PC-compatible connection (with power cord)	V400-W21-2M
	5 m		V400-W21-5M
	2 m	For PC-compatible connection (when using AC adaptor)	V400-W22-2M
	5 m		V400-W22-5M
AC adaptor	–	–	V600-A22

Ratings and specifications

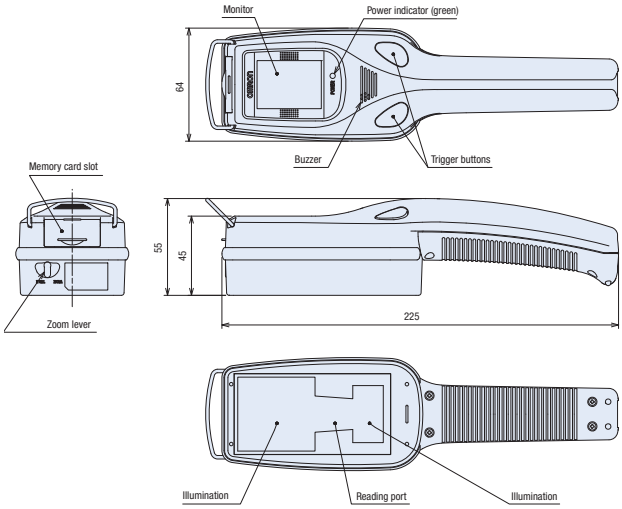
Item	V400-H111	V400-H211
Field of vision	5x5 to 10x10 mm	15x15 to 30x30 mm
Working distance	40 mm (flush when contactor is mounted)	
Power supply	5 VDC ±10%	
Current consumption	1.0 A max.	
Serial interface	RS-232C	
Applicable codes	Data matrix, ECC200, 10x10 to 64x64, 8x18 to 16x48, QR code (models 1, 2), 21x21 to 57x57 (versions 1 to 10)	
Operation method	Pressing the trigger button	
Settings	Make settings by using the manual setting window, uploading from an SD memory card, or by using support software.	
Memory card	SD memory card	
Monitor	1.8 inch TFT LCD, displaying images and read data	
Display illumination	Operation display, memory card access	
Ambient temperature	Operation: 0 to 40°C, storage: -25 to 60°C	
Ambient humidity	35 to 85% (with no condensation)	
Ambient conditions	No corrosive gases	
Vibration resistance	10 to 150 Hz, single amplitude 0.35 mm (50 m^2/s max. acceleration)	
Shock resistance	150 m^2/s in ±X, Y, and Z directions, 3 times	
Weight	Approx. 230 g	
Degree of protection	IEC 60529 IP64	
Materials	Case: ABS; optical surface: PC; display surface: PMMA	

Dimensions

(Unit: mm)

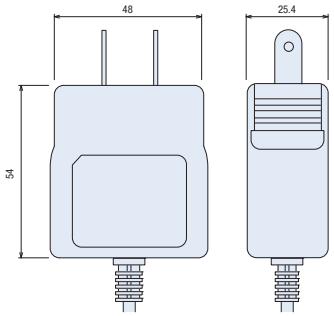
Main unit

V400-H111/V400-H211



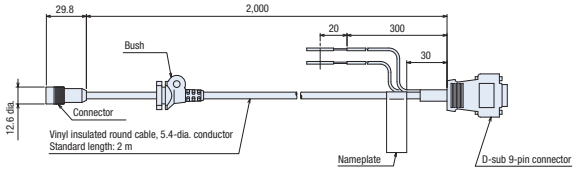
AC Adaptor

V600-A22

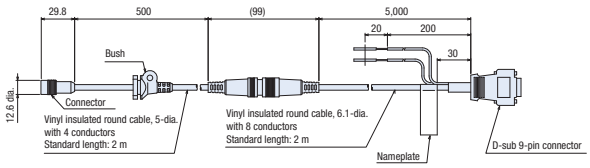


Communication cable

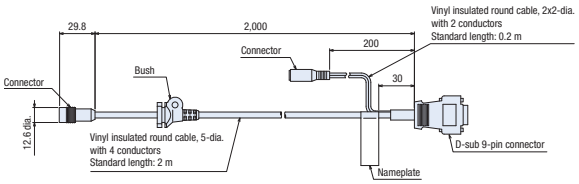
V400-W20-2M/V400-W21-2M



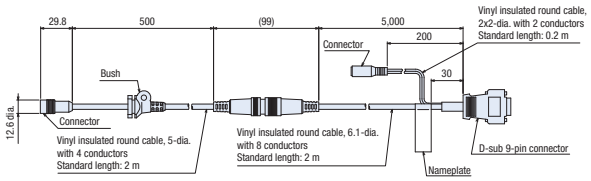
V400-W20-5M/V400-W21-5M



V400-W22-2M

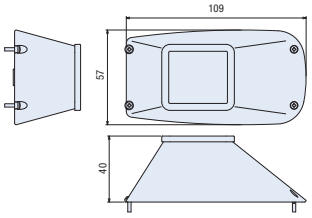


V400-W22-5M



Contactor

V400-AC2



V500-R5 Barcode Reader

Compact Laser

- Compact design
- Easy installation & setup
- Strong reading performance

Ordering information

	Product	Model
Barcode Readers	Cable output	V500-R521B2
	Round DIN connector	V500-R521C2
ID Link Unit (sold separately)		V700-L12
Cables (sold separately)	SYSMAC D-sub 9-pin cable, 0.8 m	V509-W011
	SYSMAC D-sub 9-pin cable, 5 m	V509-W016
	IBM PC/AT or compatible D-sub 9-pin cable, 0.8 m	V509-W011D
	IBM PC/AT or compatible D-sub 9-pin cable, 5 m	V509-W016D

Ratings and Specifications

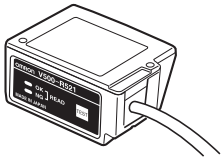
Item		V500-R_
Applicable barcodes	Type of barcode	Code 39, NW-7, ITF, STF (2 of 5 bars), Code 93, Code 128 (including EAN128), EAN/UPC (A and E)
	Number of read digits	32 digits max. (depends on bar width and read size)
Reading performance *1	Resolution	0.15 mm (for PCS0.9)
	Contrast (PCS value)	0.45 min. (70% white reflectance min.)
	Reading distance	60 to 270 mm (with 1.0-mm thin bar)
	Reading angle	Within 40° (including left and right margins)
	Skew angle	±50° (excluding the upper 10° and lower 5° ranges)
	Pitch angle	±25° (25° right and left)
	Light source	Red laser diode (wavelength: 650 nm)
	Optical output	1.0 mW max.
	Scan type	Raster scan
	Number of scans	500 scans/s
	Number of read repetitions	2 to 6 times
	Reading verification	Buzzer and LED indicators
Interfaces	Communications specifications	RS-232C
	OK/NG output (V500-R521B2 only)	30 mA at 24 VDC, NPN open-collector output
Function setting method		Menu sheet reading or host commands
Read trigger		· External trigger (transistor input) · Trigger by command (RS-232C) · Test read trigger with the TEST Button on the Reader
Read results output	RS-232C output	Read data is output.
	OK/NG signal (V500-R521B2 only)	The OK signal turns ON when reading is successful. The NG signal turns ON when reading fails.
	LED indicators	The OK indicator lights when reading is successful. The NG indicator lights when reading fails.
	Buzzer	The buzzer sounds when reading is successful. (The buzzer can be muted.)
Power supply specifications	Power supply voltage	5 VDC ±10% *2
	Current consumption	220 mA typ. (330 mA max.)
	Inrush current	2.5 A max.
Environment	Ambient temperature	Operating: 0 to 45°C, Storage: -10°C to 60°C (with no icing or condensation)
	Ambient humidity	Operating and storage: 30% to 85% (with no icing or condensation)
	Vibration resistance	12 to 100 Hz, 19.6 m/s2 acceleration in X, Y, and Z directions for 3 hours each
	Allowable ambient light	3,000 lx max. (fluorescent light; excluding inverter fluorescent lighting)
Enclosure rating		IP54 (IEC 60529 standard)
Weight		80 g (excluding cable and connector)
I/O connector		V500-R521B2: Cable output
		V500-R521C2: DIN 8-pin connector
Cable length		2 m

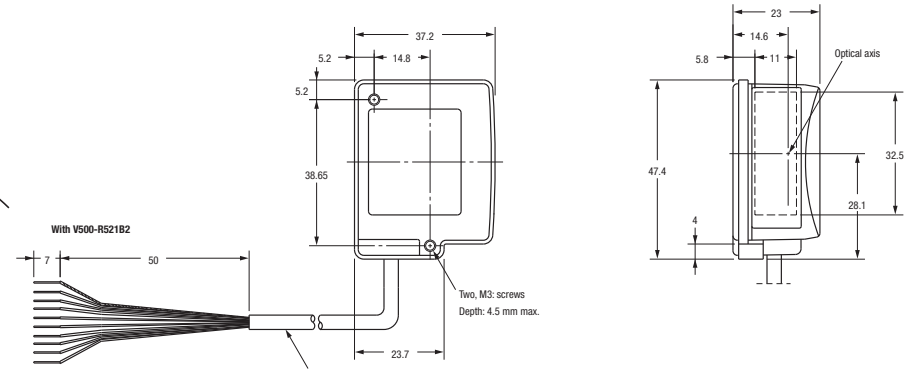
*1 Unless otherwise specified, specifications are for a barcode set to JAN 1′ with an MRD of 63% or higher (a PCS value of 0.9 or higher) is used with the pitch angle (a) set to 0°, the skew angle (b) set to 15°, the tilt angle (g) set to 0°, and the curvature (R) set to infinity.

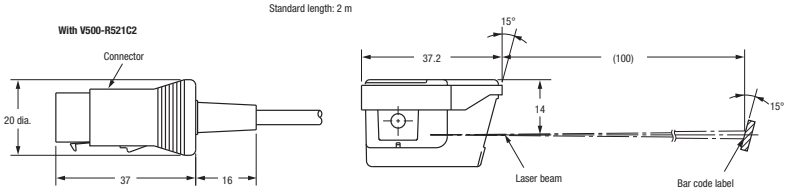
*2 The power supply voltage is specified at the I/O connector of the Barcode Reader

Dimensions

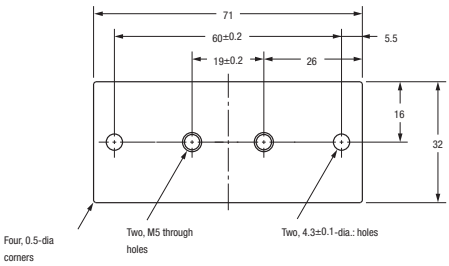
V500-R521B2/V500-R521C2





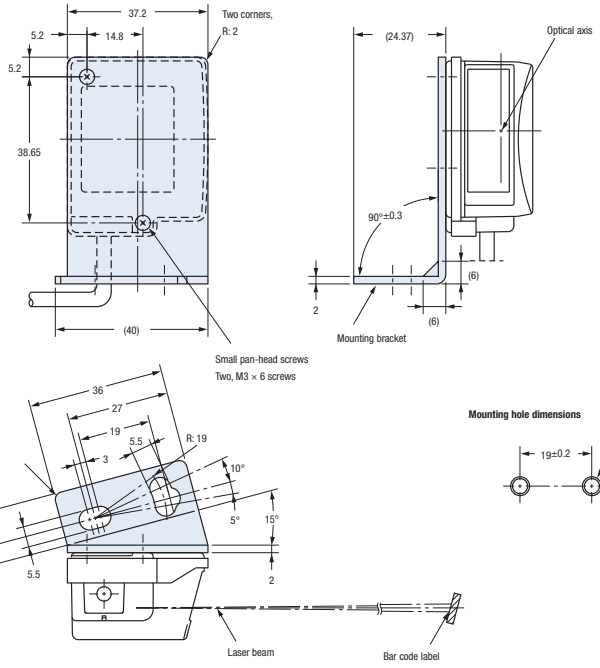


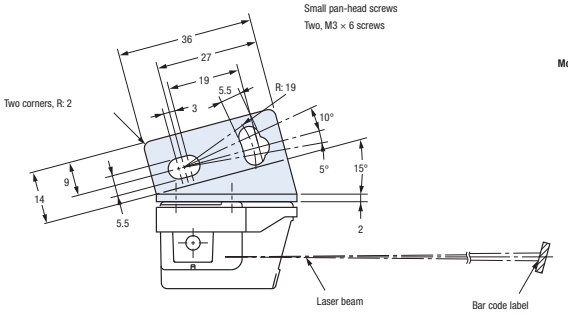
Supplied Insulation Plate



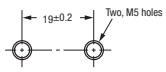
Note: The insulation plate has a thickness of 8 mm.

Mounting Bracket Attached





Mounting hole dimensions

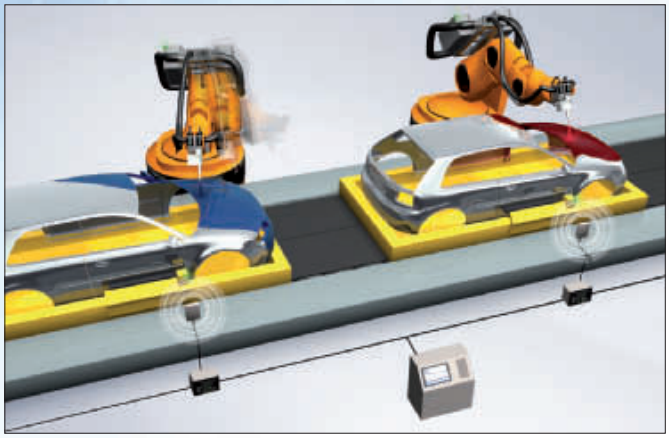


V680 RFID SYSTEM

One for all

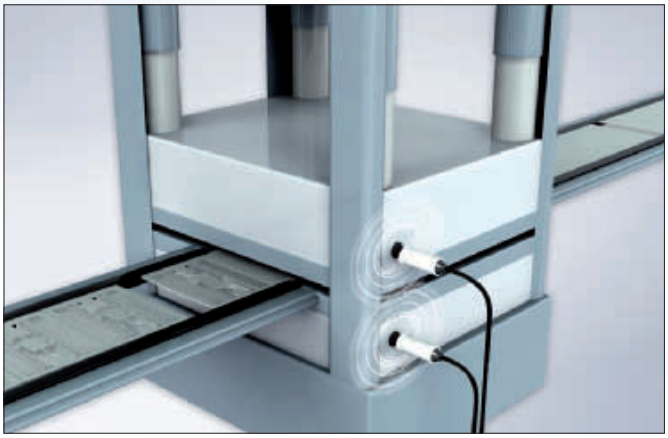
Whenever you need to have full transparency of your production process or logistic application V680 is helping you to manage your data most comfortably and reliably.

- Diagnostic functions for maintenance
- One for all: modular platform concept
- Flexible installation: long reach antennas
- Fit for speed: high turn around time
- Save time & costs: easy setup & maintenance



Production ID system for the paint shop

A RFID system is used to store the process parameters needed for the production of the car throughout the process. Harsh conditions through chemicals and high temperatures occur during the production steps. RFID is ideal for this application as it features high resistance tags for harsh conditions.

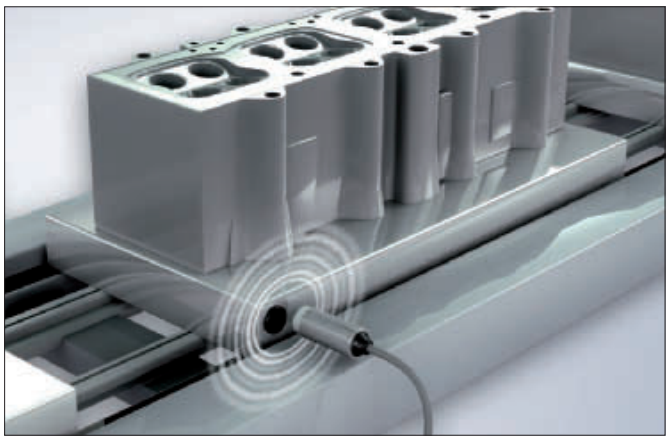


Monitoring of the moulding history

Process and maintenance related information of a moulding press can be stored by using RFID. The information can be read out permanently or on demand from a remote location and can be used to control the process.

YOUR BENEFITS

- High speed air communication
- Standardized protocol (ISO 15693)
- Large memory (up to 32kByte) and very compact tags
- Long life time of tags (FERAM variants)
- All protocols for PLC communication



Traceability of automotive parts

Track the parts in the production process. Process related information can be stored to guarantee high quality production.

Carrier Management

For the administration and traceability of transport carriers along the hole process RFID represents a smart solution. V680 is working on the standardized universal frequency of 13.56MHz. The flexible platform with its versatile and compact design can be easily integrated into any point in the production process.

V680 RFID Platform overview

Mobile transponder (FeRAM + EEPROM)

Please refer to the datasheet for the recommended antennas

V680-D1KP52MT, 1 kByte (metal mounting)
V680-D2KF52M, 2 kByte (metal mounting)

V680-D1KP66T, 2 kBytes
V680-D1KP66MT, 1 kBytes (metal mounting)

V680-D2KF67, 2 kBytes
V680-D2KF67M, 2 kBytes (metal mounting)
V680-D8KF67, 8 kBytes
V680-D8KF67M, 8 kBytes (metal mounting)

V680-D1KP66T-SP, 1 kByte
(PFA enclosure / chemical resistant)

V680-D8KF68, 8 kBytes
V680-D32KF68, 32 kBytes

Wireless data acquisition

Antenna/Interrogator*

V680-HS51/M12

V680-HS52/M22

V680-HS63, rectangular

V680-HS65, rectangular

Amplifier*

V680-HA63A, 1kByte
V680-HA63B, >1kByte

Amplifier with noice measurement function (for use of serial controller or PLC unit)

V680-H01-V2, rectangular
(with integrated amplifier)

Handheld reader/writer

Handheld reader
USB for PC/IPC use
V680 CHUD (V680-CH1D / RS232 / 5V DC connector)

Handheld reader
RS-232C for handheld terminal
V680-CH1D-PSI
5V AC adapter for V680-CH1D: E3X-MC11-S-PS3 BYOMG

Controlling device	Feature and benefits	Communication and system integration
Easy to maintain 1/2 controller for long wired serial communication V680-CA5D01-V2 (1 channel) V680-CA5D02-V2 (2 channels) 	High speed communication system noise and distance measurement for self diagnosis and preventive maintenance. Protocol analyzer function comfortable software for quick start-up and operation.	**Serial communication for long wiring (<500 m)**
Modular multi functional RFID communication system CJ1W-V680-C11 (1 channnel) CJ1W-V680-C12 (2 channels) CS1W-V680-C11 (1 channnel) CS1W-V680-C12 (2 channels) 	Future-proofed RFID system with enhanced connectivity and additional functionality. Up to 160 antennas can be cascaded Multi-functional intelligent controller for multi-purpose use. V680-C#-SYS can be operated as multi-tasking stand-alone system beside of existing PLC setups CX-One Software allows easy integration using function blocks.	**Advanced modular RFID communication system:** **- Ethernet IP** **- DeviceNet** **- PROFIBUS-DP** **- CAN** **- CompoBus/S**
V680-HAM81 PNP ID Flag Sensor V680-HAM91 NPN ID Flag Sensor 	Cost effective DeviceNet slave controller with integrated amplifier for direct connection to any DeviceNet nodes.	**DeviceNet fieldbus high speed communication (integrated amplifier)**
ID Flag Sensor (PNP/NPN) V680-HAM81/HAM91 	Easy to setup ID flag system addressing up to 64.000 ID's.	**ID flag sensor communication**
Handheld Terminal V680-A-7527S-G2-EG-S 	Wireless handheld to R/W data at any time in production process or logistics. Further possibility to communicate on PC/IPC platform via USB. Demosoftware is pre-installed.	**Handheld/PLC/PC communication**

MEASUREMENT SENSORS

Never fail in measurement

Customer satisfaction highly depends on the quality of the finished goods or the performance of the machine in use. Zero defects in production is a key criterion for success. The speed of production lines is getting increasingly faster. On the other hand the machines should never fail. But can you trust the result?

To ensure highest inspection performance these smart measurement sensors offer accurate, reliable and fast measure-ment. Various inspection principles and techno-logies always provide the best solution for your application.

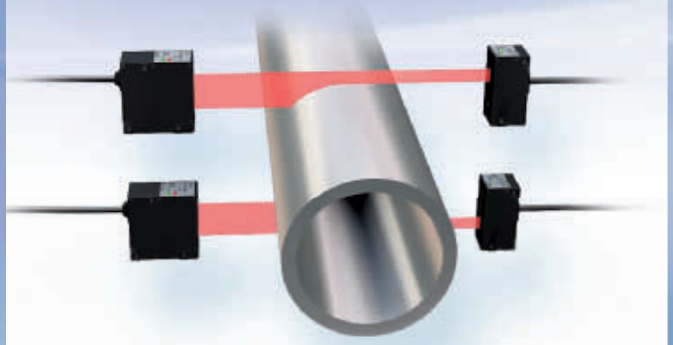
DISPLACEMENT/DISTANCE

Accurate measurement of distances can be done by laser triangulation, inductive or tactile principles.
The Smart sensors ZX and ZS represent a powerful platform matching the accuracy and technology, which is required for this application.

ZX	ZS
see page 136	see page 126

DISPLACEMENT / DISTANCE

Scan the profile of an object with a laser beam.
Depending of the height, the laser beam is reflected differently and creates the profile information. By moving the sensor or the object, the complete surface can be inspected. The Smart profile sensors ZG provides an easy to use solution.



POSITION / DIAMETER / WIDTH

Determine accurately the position or diameter of an object. The object interrupts the laser beam, which allows the edges of an object to be determined. The smart laser micrometer ZX-GT is the perfect choice for this task.
For large area monitoring and height measurements up to 2 m with cm accuracy see F3EM measuring light curtains in INDUSTRIAL SENSING GUIDE.

ZG2	ZX-GT	F3EM
see page 158	see page 166	INDUSTRIAL SENSING GUIDE

ZS-Series – All in one – Smart, accurate & scalable

The ZS laser sensor family provides outstanding measurement performance on all kind of materials. Its huge range of sensor heads and scalable concept makes it a versatile platform for all high precision sensing applications. The ZS-series features an unique sensor head for glass inspections, which simplifies mounting and allows measurements even on round glass.

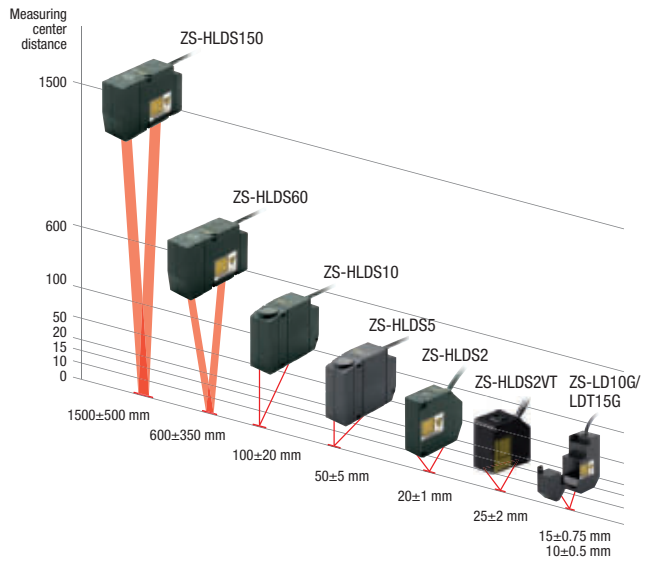
Powerful controller:

- LCD display for setup and immediate result display
- Fast sampling time: 110 µs
- Multi-tasking enabled by a single controller
- Scalability of up to 9 controllers (heads)
- Multi-controller unit (MDC)
- Remote control via communication interfaces and PC software

14 x sensor heads for any purpose:

- Flexible sensing distance: from 10 mm to 1.500 mm
- High accuracy: 0,25 – 5 µm
- Difficult surfaces: glass, shiny metal, black rubber, etc.
- Measure multiple surfaces of transparent objects
- CMOS technology

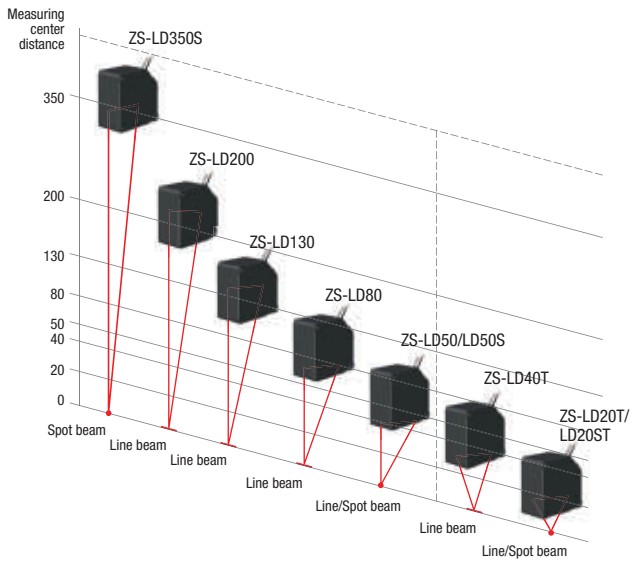
SENSOR HEADS ZS



ZS-HLDS sensor heads

Diffuse Reflective Sensors	Regular Reflective Sensors

see page 128



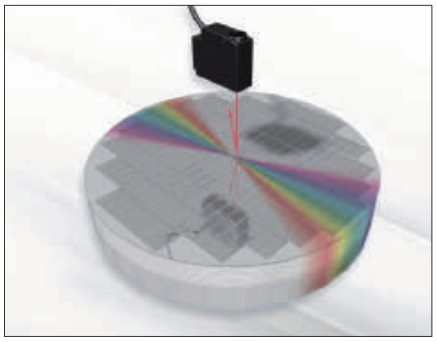
ZS-LD sensor heads

Diffuse Reflective Sensors	Regular Reflective Sensors

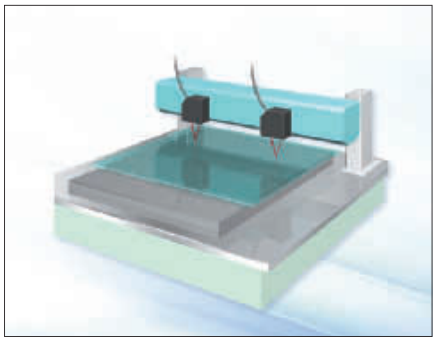
see page 128

YOUR BENEFITS

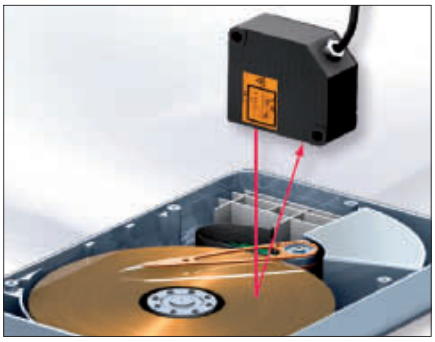
- One sensor – any surface and distance
- One controller – multi-tasking
- One software – remote control
- One solution – any application



Wafer thickness and warping inspection



Glass evenness inspection



Disk surface inspection

The scalable high-precision laser measurement sensor

The ZS laser sensor family provides outstanding measurement performance on all kind of materials. Its huge range of sensor heads and scalable concept makes it a versatile platform for all high precision sensing applications.

- Highest resolution and dynamic sensing range for all surfaces
- Modular and scalable platform concept for up to 9 sensors
- Easy to use, install and maintain for all user levels
- Fast response time of 110 µs
- Multi-tasking capability – manages up to 4 measurement tools in one controller

Ordering information

Sensors

ZS-HL-series sensor heads

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution*1	Order code
Regular reflective models	20±1 mm	Line beam	1.0 mmx20 µm	0.25 µm	ZS-HLDS2T
	25±2 mm		2.2 mmx45 µm	0.6 µm	ZS-HLDS2VT
Diffuse reflective models	50±5 mm		1.0 mmx30 µm	0.25 µm	ZS-HLDS5T
	100±20 mm		3.5 mmx60 µm	1 µm	ZS-HLDS10
	600±350 mm		16 mmx0.3 mm	8 µm	ZS-HLDS60
	1500±500 mm		40 mmx1.5 mm	500 µm	ZS-HLDS150

*1 Refer to the table of ratings and specifications for details.

ZS-HL-series sensor heads (for nozzle gaps) also compatible with ZS-L controller

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution*1	Order code
Regular reflective models	10±0.5 mm	Line beam	900x25 µm	0.25 µm	ZS-LD10GT
	15±0.75 mm				ZS-LD15GT

*1 Refer to the table of ratings and specifications for details.

ZS-L-series sensor heads

Optical system	Sensing distance	Beam shape	Beam diameter	Resolution*1	Order code
Regular reflective models	20±1 mm	Line beam	900x25 µm	0.25 µm	ZS-LD20T
		Spot beam	25 µm dia.		ZS-LD20ST
	40±2.5 mm	Line beam	2000x35 µm		ZS-LD40T
Diffuse reflective models	50±5 mm	Line beam	900x60 µm	0.8 µm	ZS-LD50
		Spot beam	50 µm dia.		ZS-LD50S
	80±15 mm	Line beam	900x60 µm	2 µm	ZS-LD80
	130±15 mm	Line beam	600x70 µm	3 µm	ZS-LD130
	200 ±50 mm	Line beam	900x100 µm	5 µm	ZS-LD200
	350 ±135 mm	Spot beam	240 µm dia.	20 µm	ZS-LD350S

*1 This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.

ZS-HL-series sensor controllers

Supply voltage	Control outputs	Order code
24 VDC	NPN outputs	ZS-HLDC11
	PNP outputs	ZS-HLDC41
		ZS-HLDC41A (incl. USB cable + Smart monitor)

Multi-controllers

Supply voltage	Control outputs	Order code
24 VDC	NPN outputs	ZS-MDC11
	PNP outputs	ZS-MDC41

Data storage units

Supply voltage	Control outputs	Order code
24 VDC	NPN outputs	ZS-DSU11
	PNP outputs	ZS-DSU41

Accessories (sold separately)

Controller link

Item	Order code
Controller link	ZS-XCN

Panel mount adapter

Model	Order code
For 1st controller	ZS-XPM1
For expansion (from 2nd controller on)	ZS-XPM2

Cables for connecting to a Personal Computer

Type	Quantity	Order code
RS-232C	1	ZS-XRS2
USB	1	ZS-XUSB2

Extension cables for sensor heads

Cable length	Quantity	Order code
1 m	1	ZS-XC1A
4 m	1	ZS-XC4A
5 m	1	ZS-XC5B*1,*2
8 m	1	ZS-XC8A
10 m	1	ZS-XC10B*1

*1 Up to two ZS-XC_B cables can be connected (22 m max.).
*2 A robot cable (ZS-XC5BR) is also available.

Logging software

Item	Order code
Smart monitor zero professional	ZS-SW11E

Memory card

Model	Order code
64 MB	F160-N64S(S)
128 MB	QM300-N128S
256 MB	F160-N256S

Safety precautions for using laser equipment

Laser Label Indications

Attach the following warning label to the side of the ZS-L-series Sensor Head.

Specifications

Sensor heads

ZS-HL-series sensor heads

Item		ZS-HLDS2T		ZS-HLDS2VT	ZS-HLDS5T		ZS-HLDS10		ZS-HLDS60	ZS-HLDS150
Applicable controllers		ZS-HLDC series								
Optical system		Regular reflection	Diffuse reflection	Regular reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Diffuse reflection	Diffuse reflection
Measuring center distance		20 mm	5.2 mm	25 mm	44 mm	50 mm	94 mm	100 mm	600 mm	1,500 mm
Measuring range		±1 mm	±1 mm	±2 mm	±4 mm	±5 mm	±16 mm	±20 mm	±350 mm	±500 mm
Light source		Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Clas							Visible semiconductor laser (wavelength 658 nm, 1 mW max., Class 2)	
Beam shape		Line beam								
Beam diameter*1		1.0 mmx20 µm		2.2 mmx45 µm	1.0 mmx30 µm		3.5 mmx60 µm		0.3 mmx16 mm	1.5 mmx40 mm
Linearity*2		±0.05% F.S.		±0.2 %F.S.	±0.1% F.S.				±0.07 %F.S. (250 mm to 750 mm) ±0.1% F.S. (750 mm to 950 mm)	±0.2 %F.S.
Resolution*3		0.25 µm (No. of samples to average: 256)		0.5 µm (No. of samples to average: 128)	0.25 µm (No. of samples to average: 512)		1 µm (No. of samples to average: 64)		8 µm (average 64) (at 250 mm) 40 µm (average 64) (at 600 mm)	500 µm (average 64)
Temperature characteristic*4		0.01% F.S./°C		0.1% F.S./°C	0.01% F.S./°C					
Sampling cycle		110 µs (high-speed mode), 500 µs (standard mode), 2.2 ms (high-precision mode), 4.4 ms (high-sensitivity mode)								
Indicators	NEAR indicator	Lits near the measurement center, and nearer than the measurement center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.								
	FAR indicator	Lits near the measurement center, and further than the measurement center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.								
Operating ambient illumination		Illumination on received light surface 3,000 lx or less (incandescent light)							Illumination on received light surface 1,000 lx or less (incandescent light)	Illumination on received light surface 500 lx or less (incandescent light)
Ambient temperature		Operating: 0 to +50°C, storage: -15 to +60°C (with no icing or condensation)								
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)								
Degree of protection		IP64		IP67	Cable length 0.5 m: IP66, cable length 2 m: IP67				IP66 (IEC60529)	
Vibration resistance (destructive)		10 to 150 Hz, 0.7 mm double amplitude, 80 min each in X, Y, and Z directions								
Shock resistance (destructive)		150 m/s² 3 times each in six directions (up/down, left/right, forward/backward)								
Materials		Case: aluminum die-cast, front cover: glass								
Cable length		0.5 m, 2 m		2 m	0.5 m, 2 m					
Weight		Approx. 350 g			Approx. 600 g				Approx. 800 g	

*1 Defined as 1/e² (13.5%) of the center optical intensity in the measurement center distance. The beam diameter is sometimes influenced by the ambient conditions of the workpiece such as leaked light from the main beam.

*2 This is the error on the measured value with respect to an ideal straight line. Linear curve may change according to the workpiece. The following lists the workpieces

Model	Diffusive reflection	Mirror reflection
ZS-HLDS2T	SUS block	Glass
ZS-HLDS5T/HLDS10	White alumina ceramic	Glass
ZS-HLDS60/HLDS150	White alumina ceramic	-
ZS-HLDS2VT	-	Glass

*3 This is the “peak-to-peak” displacement conversion value of the displacement output in the measurement center distance when high-resolution mode and the average number in the table are set (For ZS-HLDS60, the maximum resolution at 250 mm is also included). The following lists the workpieces.

Model	Diffusive reflection	Mirror reflection
ZS-HLDS2T	SUS block	Glass
ZS-HLDS5T	White alumina ceramic	Glass
ZS-HLDS10	White alumina ceramic	
ZS-HLDS60/HLDS150	White alumina ceramic	-
ZS-HLDS2VT	-	Glass

*4 Value obtained when the sensor part and object part are fixed with an aluminum jig.

ZS-L-series sensor heads

Item		ZS-LD20T		ZS-LD20ST		ZS-LD40T		ZS-LD10GT	ZS-LD15GT
Applicable controllers		ZS-HLDC/LDC series							
Optical system		Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	Diffuse reflection	Regular reflection	
Measuring center distance		20 mm	6.3 mm	20 mm	6.3 mm	40 mm	30 mm	10 mm	15 mm
Measuring range		±1 mm	±1 mm	±1 mm	±1 mm	±2.5 mm	±2 mm	±0.5 mm	±0.75 mm
Light source		Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Class 2)							
Beam shape		Line beam		Spot beam		Line beam			
Beam diameter*1		900 x 25 µm		25 µm dia.		2,000 x 35 µm		Approx. 25 x 900 µm	
Linearity*2		±0.1%F.S							
Resolution*3		0.25 µm		0.25 µm		0.4 µm		0.25 µm	0.25 µm
Temperature characteristic*4		0.04% FS/°C		0.04% FS/°C		0.02% FS/°C		0.04% FS/°C	
Sampling cycle*5		110 µs (high-speed mode), 500 µs (standard mode), 2.2 ms (high-precision mode), 4.4 ms (high-sensitivity mode)							
Indicators	NEAR indicator	Lights near the measuring center distance, and nearer than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.							
	FAR indicator	Lights near the measuring center distance, and further than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.							
Operating ambient illumination		Illumination on received light surface: 3,000 lx or less (incandescent light)							
Ambient temperature		Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)							
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)							
Degree of protection		Cable length 0.5 m: IP66, cable length 2 m: IP67						IP40	
Materials		Case: Aluminum die-cast, front cover: Glass							
Cable length		0.5 m, 2 m							
Weight		Approx. 350 g						Approx. 400 g	
Accessories		Laser labels (1 each for JIS/EN, 3 for FDA), ferrite cores (2), insure Locks (2), instruction sheet						Laser safety labels (1 each for JIS/EN),ferrite cores (2), insure locks (2)	

*1 Defined as 1/e² (13.5%) of the center optical intensity at the actual measurement center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.
*2 This is the error in the measured value with respect to an ideal straight line. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode of the ZS-LD20T/40T/50. Linearity may change according to the workpiece.
*3 This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.
*4 This is the value obtained at the measuring center distance when the Sensor and workpiece are fixed by an aluminum jig.
*5 This value is obtained when the measuring mode is set to the high-speed mode.

ZS-L-series sensor heads

Item		ZS-LD50		ZS-LD50S		ZS-LD80		ZS-LD130		ZS-LD200		ZS-LD350S
Applicable controllers		ZS-HLDC/LDC series										
Optical system (reflection)		Diffuse	Regular	Diffuse	Regular	Diffuse	Regular	Diffuse	Regular	Diffuse	Regular	Diffuse
Measuring center distance		50 mm	47 mm	50 mm	47 mm	80 mm	78 mm	130 mm	130 mm	200 mm	200 mm	350 mm
Measuring range		±5 mm	±4 mm	±5 mm	±4 mm	±15 mm	±14 mm	±15 mm	±12 mm	±50 mm	±48 mm	±135 mm
Light source		Visible semiconductor laser (wavelength: 650 nm, 1 mW max., JIS Class 2)										
Beam shape		Line beam		Spot beam		Line beam		Line beam		Line beam		Spot beam
Beam diameter*1		900 x 60 µm		50 µm dia.		900 x 60 µm		600 x 70 µm		900 x 100 µm		240 µm dia.
Linearity*2		±0.1%F.S.							±0.25%F.S.	±0.1%F.S.	±0.25%F.S.	±0.04%F.S.
Resolution*3		0.8 µm		0.8 µm		2 µm		3 µm		5 µm		20 µm
Temperature characteristic*4		0.02% FS/°C		0.02% FS/°C		0.01% FS/°C		0.02% FS/°C		0.02% FS/°C		0.04% FS/°C
Sampling cycle*5		110 µs (high-speed mode), 500 µs (standard mode), 2.2 ms (high-precision mode), 4.4 ms (high-sensitivity mode)										
Indicators	NEAR indicator	Lights near the measuring center distance, and nearer than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.										
	FAR indicator	Lights near the measuring center distance, and further than the measuring center distance inside the measuring range. Flashes when the measurement target is outside of the measuring range or when the received light amount is insufficient.										
Operating ambient illumination		Illumination on received light surface: 3,000 lx or less (incandescent light)						Illumination on received light surface: 2,000 lx or less (incandescent light)		Illumination on received light surface: 3,000 lx or less (incandescent light)		
Ambient temperature		Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)										
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)										
Degree of protection		Cable length 0.5 m: IP66, cable length 2 m: IP67										
Materials		Case: Aluminum die-cast, front cover: Glass										
Cable length		0.5 m, 2 m										
Weight		Approx. 350 g										
Accessories		Laser labels (1 each for JIS/EN, 3 for FDA), ferrite cores (2), insure Locks (2), instruction sheet										

*1 Defined as 1/e² (13.5%) of the center optical intensity at the actual measurement center distance (effective value). The beam diameter is sometimes influenced by the ambient conditions of the workpiece, such as leaked light from the main beam.
*2 This is the error in the measured value with respect to an ideal straight line. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode of the ZS-LD20T/40T/50. Linearity may change according to the workpiece.
*3 This is the peak-to-peak displacement conversion value in the displacement output at the measuring center distance in high-precision mode when the number of samples to average is set to 128 and the measuring mode is set to the high-resolution mode. The standard workpiece is white aluminum ceramics in diffuse reflection mode and glass in the regular reflection mode.
*4 This is the value obtained at the measuring center distance when the sensor and workpiece are fixed by an aluminum jig.
*5 This value is obtained when the measuring mode is set to the high-speed mode.

Sensor controllers

ZS-HL-series sensor controllers

Item			ZS-HLDC11	ZS-HLDC41
NPN/PNP			NPN	PNP
No. of samples to average			1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096	
Number of mounted sensors			1 per sensor controller	
External interface	Connection method		Serial I/O: connector, other: pre-wired (standard cable length: 2 m)	
	Serial I/O	USB 2.0	1 port, full speed (12 Mbps max.), MINI-B	
		RS-232C	1 port, 115,200 bps. max.	
	Output	Judgement output	HIGH/PASS/LOW 3 outputs NPN open collector, 30 VDC, 50 mA max., residual voltage 1.2 V max	HIGH/PASS/LOW: 3 outputs PNP open collector, 50 mA max., residual voltage 1.2 V max
		Linear output	Selectable from 2 types of output, voltage or current (selected by slide switch on bottom). Voltage output: .10 to 10 V, output impedance: 40 Ω Current output: 4 to 20 mA	
	Inputs	Laser OFF, ZERO reset timing, RESET	ON: Short-circuited with 0 V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage. OFF: Open (leakage current: 0.1 mA max.)
Functions			Display: Measured value, threshold value, voltage/current, received light amount, and resolution/terminal block output Sensing: Mode, gain, measurement object, head installation Measurement point: Average, peak, bottom, thickness, step, and calculations Filter: Smooth, average, and differentiation Outputs: Scaling, various hold values, and zero reset I/O settings: Linear (focus/correction), judgments (hysteresis and timer), non-measurement, and bank (switching and clear) System: Save, initialization, measurement information display, communications settings, key lock, language, and data load Task: Single task or multitask (up to 4)	
Status indicators			HIGH (orange), PASS (green), LOW (orange), LDON (green), ZERO (green), and ENABLE (green)	
Segment display		Main digital	8-segment red LED, 6 digits	
		Sub-digital	8-segment green LEDs, 6 digits	
LCD			16 digitsx2 rows, colour of characters: green, resolution per character: 5x8 pixel matrix	
Setting inputs		Setting keys	Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)	
		Slide switch	Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)	
Power supply voltage			21.6 V to 26.4 VDC (including ripple)	
Current consumption			0.5 A max. (when sensor head is connected)	
Ambient temperature			Operating: 0 to 50°C, storage: -15 to +60°C (with no icing or condensation)	
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)	
Degree of protection			IP20	
Materials			Case: Polycarbonate (PC)	
Weight			Approx. 280 g (excluding packing materials and accessories)	
Accessories			Ferrite core (1), instruction sheet	

ZS-MDC11/MDC41 multi controllers

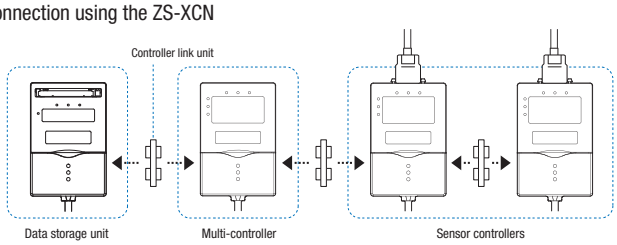
Basic specifications are the same as those for the sensor controllers.

The following points, however, are different.

(1) Sensor heads cannot be connected.
(2) A maximum 9 of controllers can be connected. Control link units are required to connect controllers.
(3) Processing functions between controllers: Math functions

Controller link unit

Connection using the ZS-XCN



Data storage units

Sensor controllers	Model		ZS-DSU11	ZS-DSU41
Number of mounted censor heads			Cannot be connected	
Number of connectable controllers			10 controllers max. (ZS-MDC: 1 controller, ZS-HLDC: 9 controllers max.)*1	
Connectable controllers			ZS-HLDC__, ZS-MDC__	
External interface	Connection method		Serial I/O: connector, other: pre-wired (standard cable length: 2 m)	
	Serial I/O	USB 2.0	1 port, full speed (12 Mbps), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
	Outputs		3 outputs: HIGH, PASS, and LOW NPN open-collector, 30 VDC, 50 mA max., residual voltage: 1.2 V max.	3 outputs: HIGH, PASS, and LOW PNP open-collector, 50 mA max., residual voltage: 1.2 V max.
	Inputs		ON: Short-circuited with 0V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Short-circuited to supply voltage or within 1.5 V of supply voltage OFF: Open (leakage current: 0.1 mA max.)
Data resolution			32 bits	
Functions	Logging trigger functions		Start and stop triggers can be set separately; external triggers, data triggers (self-triggers), and time triggers	
	Other functions		External banks, alarm outputs, saved data format customization, and clock	
Status indicators			OUT (orange), PWR (green), ACCESS (orange), and ERR (red)	
Segment display			8-segment green LEDs, 6 digits	
LCD			16 digitsx2 rows, colour of characters: green, resolution per character: 5x8 pixel matrix	
Setting inputs		Setting keys	Direction keys (UP, DOWN, LEFT, and RIGHT), SET key, ESC key, MENU key, and function keys (1 to 4)	
		Slide switch	Threshold switch (2 states: High/Low), mode switch (3 states: FUN, TEACH, and RUN)	

Sensor controllers Model	ZS-DSU11	ZS-DSU41
Power supply voltage	21.6 V to 26.4 VDC (including ripple)	
Current consumption	0.5 A max.	
Ambient temperature	Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Materials	Case: Polycarbonate (PC)	
Weight	Approx. 280 g (excluding packing materials and accessories)	
Accessories	Ferrite core (1) instruction sheet, tools for data storage unit: CSV file converter for data storage unit, smart analyzer macro edition (Excel macros for analysis of collected data)	

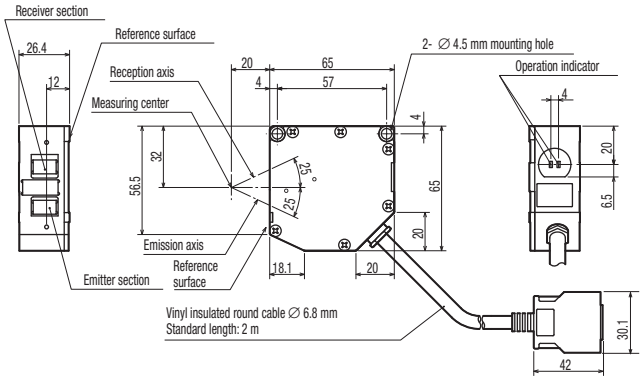
*1 Control link units are required to connect controllers.

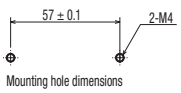
Dimensions

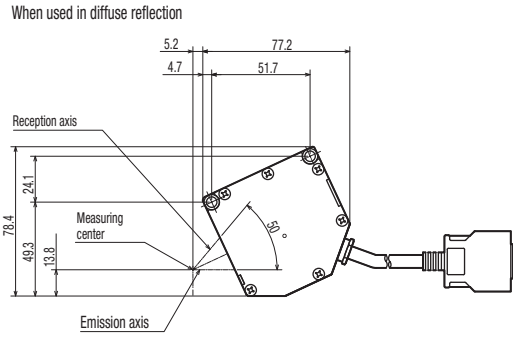
(Unit: mm)

Sensor heads

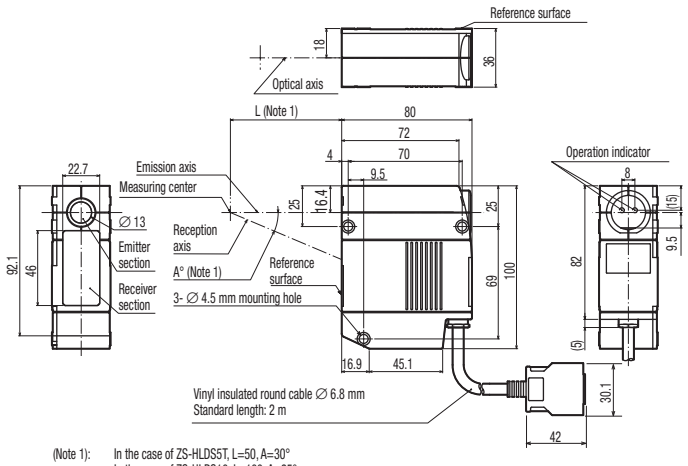
ZS-HLDS2T



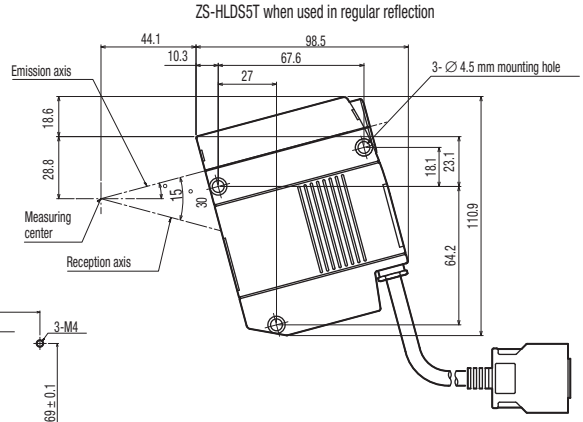


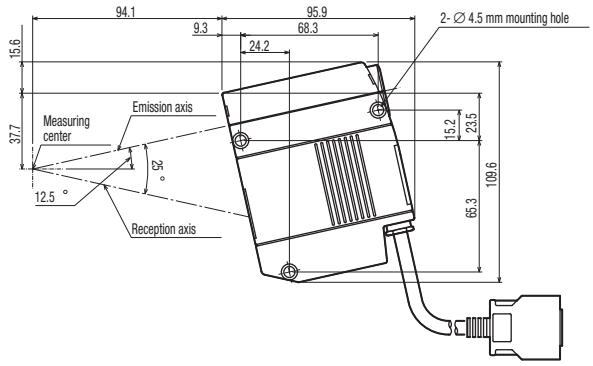


ZS-HLDS5T/HLDS10

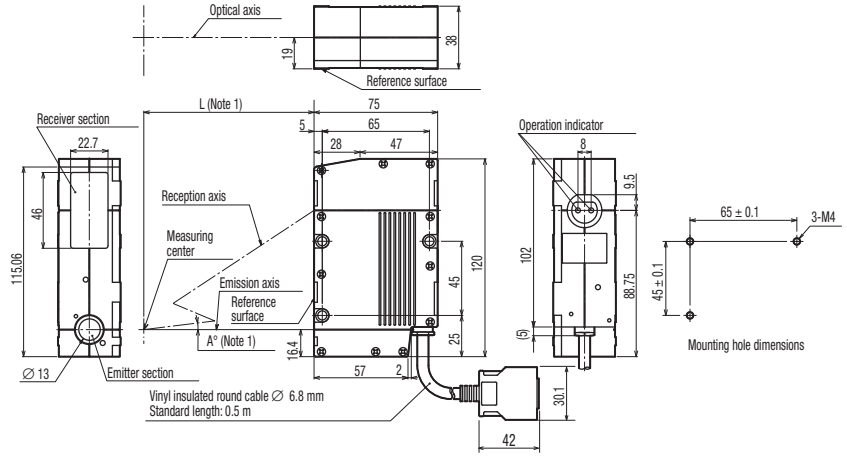


(Note 1): In the case of ZS-HLDS5T, L=50, A=30°
In the case of ZS-HLDS10, L=100, A=25°



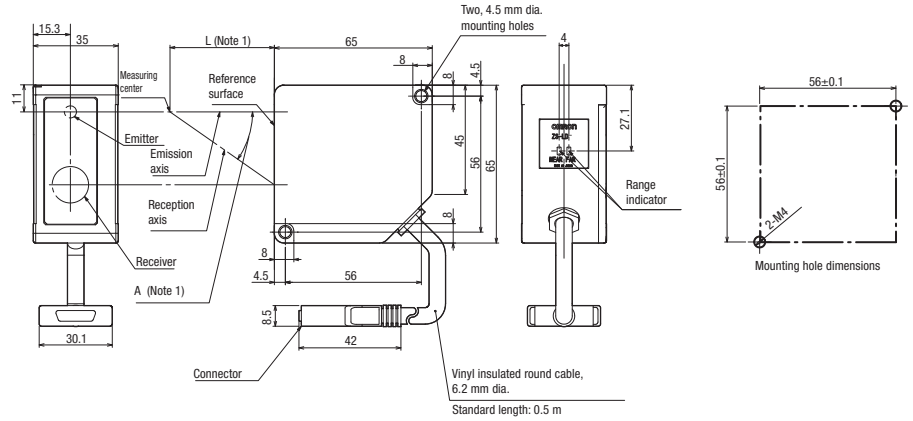


ZS-HLDS60/HLDS150



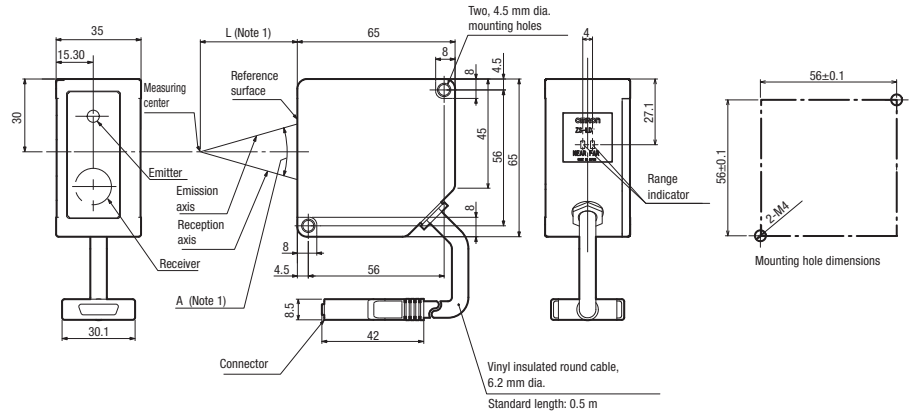
(Note 1): In the case of ZS-HLDS60, L=600, A=7°
In the case of ZS-HLDS150, L=1500, A=3°

ZS-LD50/LD50S/LD80/LD130/LD200/LD350S



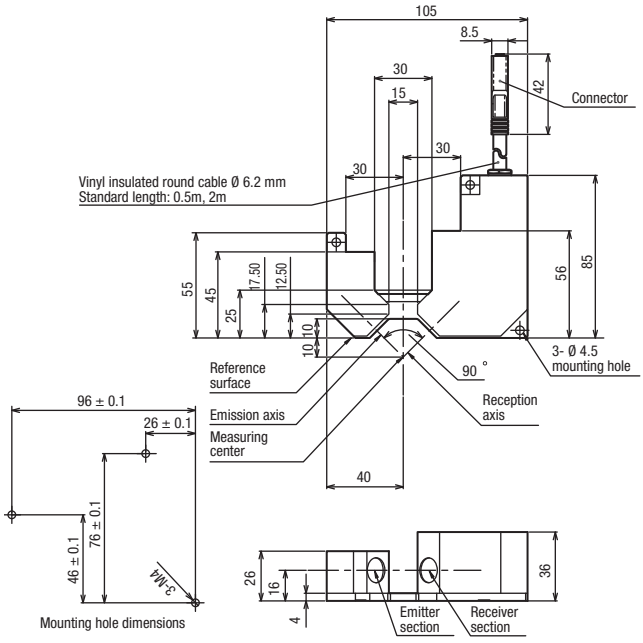
Note 1
ZS-LD50: L = 50, A = 25°
ZS-LD50S: L = 50, A = 25°
ZS-LD80: L = 80, A = 15°
ZS-LD130: L = 130, A = 12°
ZS-LD200: L = 200, A = 8°
ZS-LD350S: L = 350, A = 5°

ZS-LD20T/LD20ST/LD40T

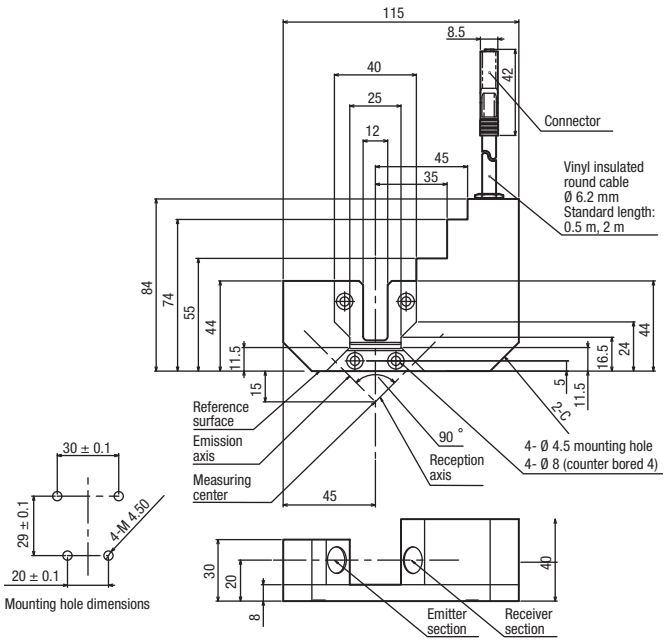


Note 1
ZS-LD20T: L = 20, A = 45°
ZS-LD20ST: L = 20, A = 45°
ZS-LD40T: L = 40, A = 32°

ZS-LD10GT

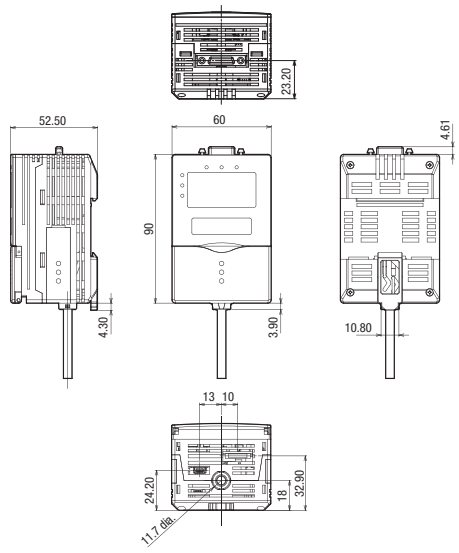


ZS-LD15GT

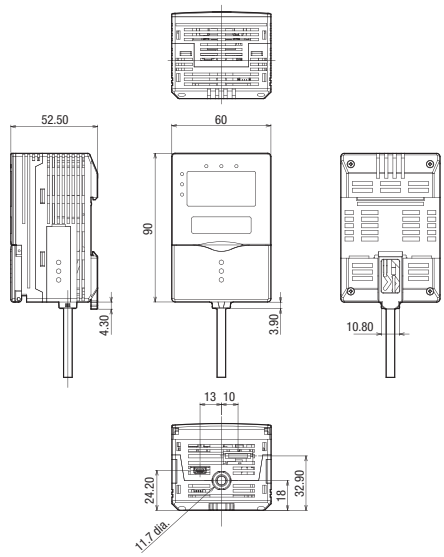


Sensor controllers

ZS-HLDC11/HLDC41

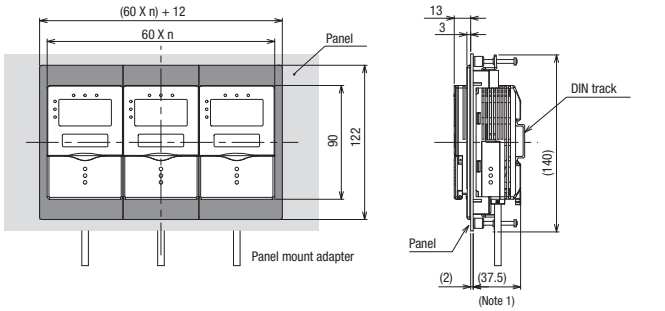


ZS-MDC11/MDC41 Multi-controllers

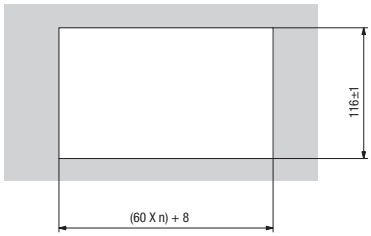


Panel mount adapters

ZS-XPM1/XPM2 (Dimension for panel mounting)



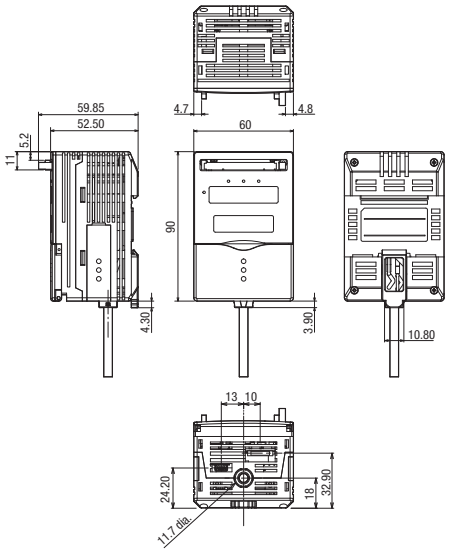
Panel cutout dimensions



Note 1: Dimensions are shown for a panel thickness of 2.0 mm
n: Number of gang-mounted controllers (1 to 11)

Data storage unit

ZS-DSU11/DSU41



ZX-Series – smart sensing in different technologies

The ZX displacement sensor platform offers a variety of interchangeable sensor heads, including laser, inductive and contact types. They can be easily connected to a standard amplifier.

Simply select the sensor head that fits your application based on material and accuracy. The easy exchange of sensor heads reduces installation time and saves maintenance costs.

The modular platform enables different sensing technologies to be combined in one platform. The easy set-up of ZX can be done with the amplifier or by the intuitive Smart Monitor PC software.

SENSOR HEADS ZX

ZX-L – smart laser displacement

- Sensing range from 2 mm – 500 mm
- High resolution
- Fast response time
- Surfaces: plastic, metal, paper, rubber, etc.

see page 142

ZX-E – smart inductive displacement

- High resolution of 1 µm
- Sensing range from 0.5 mm – 7 mm
- High linearity for any metal
- Mutual interference prevention
- Thickness, evenness, warpage measurement

see page 148

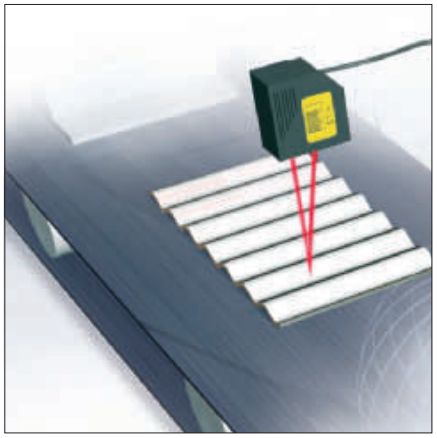
ZX-T – Smart contact measurement

- Wide range of heads and contact tips
- Long life ball bearing structure
- High resolution of 0.1 µm
- Pressing force alarm to prevent malfunctions

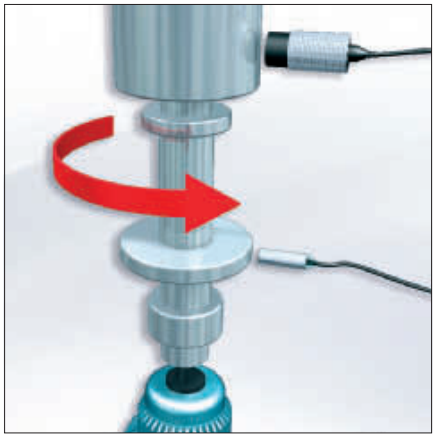
see page 153

YOUR BENEFITS

- Modular platform
- Combine tactile, inductive and laser sensors
- Plug and play – interchangeable sensor heads
- Multi-point measurements
- Calculate and communicate
- Digital I/Os and analogue outputs



Measurement of structured surfaces



Eccentricity control of a rotating shaft

Thickness measurement

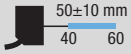
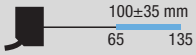
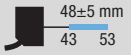
Stable, easy & affordable laser measurement sensor

High accuracy and measurement stability, at an affordable price. The new ZX2 laser sensor offers best in class performance for accuracy and speed for all linear displacement applications. Utilising an advanced HSDR-CMOS image sensor, high measurement stability is achieved, even on the most challenging of surfaces.

- One touch setup
- Accurate: 1.5–5 µm
- Any surface
- High speed: 30 µs

Ordering information

Sensor heads

Optical system	Beam shape	Sensing distance	Resolution	Order code
Diffuse-reflective	Line beam		1.5 µm	ZX2-LD50L
	Spot beam			ZX2-LD50
	Line beam		5 µm	ZX2-LD100L
	Spot beam			ZX2-LD100
Regular reflective	Spot beam		1.5 µm	ZX2-LD50V

Amplifier units

Power supply	Output type	Order code
DC	NPN	ZX2-LDA11
	PNP	ZX2-LDA41

Accessories (order separately)

These are not included with the Sensor Head or Amplifier Unit.
Please order as necessary.

Calculating unit

	Order code
Calculating unit	ZX2-CAL

Sensor head extension cables*1

Cable length	Order code
1 m	ZX2-XC1R
4 m	ZX2-XC4R
9 m	ZX2-XC9R
20 m	ZX2-XC20R

*1. Extension cables cannot be coupled and used together.

Mounting brackets

Applicable Sensor Heads	Appearance	Contents	Order code
ZX2-LD50V ZX2-LD50L ZX2-LD50		Mounting Bracket: 1 Nut plate: 1 Phillips screws (M3×30): 2	E39-L178
ZX2-LD100L ZX2-LD100			E39-L179

Specifications

Diffuse reflective Sensor Heads

Item Model	ZX2-LD50L	ZX2-LD50	ZX2-LD100L	ZX2-LD100
Optical system	Diffuse reflective			
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 1 mW max.			
	EN class 2,FDA class II*5			
Measurement center point	50 mm		100 mm	
Measurement range	±10 mm		±35 mm	
Beam shape	Line	Spot	Line	Spot
Beam size*1	Approx. 60 μm×2.6 mm	Approx. 60 μm dia.	Approx.110 μm×2.7 mm	Approx.110 μm dia.
Resolution*2	1.5 μm		5 μm	
Linearity*3	±0.05% F.S. (40 to 50 mm)	±0.1% F.S. (40 to 50 mm)	±0.05%F.S. (65 to 100 mm)	±0.1%F.S. (65 to 100 mm)
	±0.1% F.S. (entire range)	±0.15% F.S. (entire range)	±0.1% F.S. (entire range)	±0.15% F.S. (entire range)
Temperature characteristic*4	0.02% F.S./°C			
Ambient illumination	Incandescent lamp: 10,000 lx max. (on light receiving side)			
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)			
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute.			
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes. each in X,Y,and Z directions			
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down,left/right,forward/backward)			
Degree of protection	IEC60529, IP67			
Connection method	Connector connection (standard cable length: 500 mm)			
Weight (packed state)	Approx.160 g (Sensor Head only: Approx.75 g)			
Materials	Case and cover: PBT (polybutylene terephtahalate), Optical window: Glass, Cable: PVC			
Accessories	Instruction sheet, Ferrite core, Laser warning label (English), FDA certification label			

Regular-reflective Sensor Heads

Item Model	ZX2-LD50V
Optical system	Regular reflective
Light source (wave length)	Visible-light semiconductor laser with a wavelength of 660 nm and an output of 0.24 mW max. EN class 1, FDA class I
Measurement center point	48 mm
Measurement range	±5 mm
Beam shape	Spot
Beam size*1	Approx. 60 μm dia.
Resolution*2	1.5 μm
Linearity*3	±0.3% F.S. (entire range)
Temperature characteristic*4	0.06% F.S./°C
Ambient illumination	Incandescent lamp: 10,000 lx max. (on light receiving side)
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 minute.
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 minutes. each in X,Y,and Z directions
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down,left/right,forward/backward)
Degree of protection	IEC 60529, IP67
Connection method	Connector connection (standard cable length: 500 mm)
Weight (packed state)	Approx.160 g (Sensor Head only: Approx.75 g)
Materials	Case and cover: PBT (polybutylene terephtahalate), Optical window: Glass, Cable: PVC
Accessories	Instruction sheet, Ferrite core, Laser warning label (English)

*1 Beam size: Defined as 1/e^2 (13.5%) of the central intensity at the smallest value of diameter for the measurement range (typical value) False detections can occur in the case there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.

*2 Resolution: indicates the degree of fluctuation (±3σ) of analog output when connected to the ZX2-LDA. (The measured value is given for the center distance for OMRON's standard target object (diffuse-reflective models: white ceramic object, regular-reflective models: 1/4 λ flat mirror) when the response time of the ZX2-LDA is set to 128 ms.)
Indicates the repetition accuracy for when the workpiece is in a state of rest. Not an indication of distance accuracy. Resolution performance may not be satisfied in a strong electromagnetic field.

*3 Linearity: indicates the error with respect to the ideal straight line of the displacement output in the case of measuring Omron' s standard target object. Linearity and measured value may vary depending on target object. F.S. indicates the full scope of the measurement range. (ZX2-LD50 (L): 20mm)

*4 Temperature characteristic: Value for the case the space between the sensor head and Omron's standard target object is secured by an aluminum jig. (Measured at the measurement center distance)

*5 These Sensors are classified as Class 2 laser devices for diffuse-reflective models and Class 1 for regular-reflective models under EN 606825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH registration has been completed for diffuse-reflective models and is scheduled for regular-reflective models.

Note: False detection outside the measurement range can occur in the case of an object with high reflectance.

Amplifier units

Item	ZX2-LDA11	ZX2-LDA41
Measurement period*1	Min 30 μs	
Response time	60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms	
Analog output*2	4 to 20 mA, Max. load resistance: 300Ω, ±5VDC or 1 to 5 VDC, Output impedance: 100Ω	
Judgement outputs (HIGH/PASS/LOW: 3 outputs), error output	NPN open-collector outputs, 30 VDC, 50 mA max.(residual voltage: 1 V max. for load current 10 mA max.,2 V max. for load current above 10 mA)	PNP open-collector outputs, 30 VDC, 50 mA max.(residual voltage: 1 V max. for load current 10 mA max., 2 V max. for load current above 10 mA)
Laser OFF input, zero reset input, timing input, reset input, bank input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)
Functions	Smart tuning, scaling, sample hold, peak hold, bottom hold, peak-to-peak hold, self-peak hold, self-bottom hold, average hold, zero reset, On-delay timer, OFF-delay timer, keep/clamp switch, (A-B)calculations*3, thickness calculation*3, mutual interference prevention*3, laser deterioration detection, bank function (4 banks)	
Indications	Judgement indicators: HIGH (orange), PASS (green), LOW (orange), 11-segment main display (red), 11-segmentsub-display (orange), laser ON (green), zero reset (green), enable (green), menu (green), HIGH threshold (orange), LOW threshold (orange)	
Power supply voltage	10 to 30 VDC, including 10% ripple(p-p)	
Power consumption	3,000 mW max. with power supply voltage of 30 VDC and power supply current of 100 mA (with Sensor connected)	
Ambient temperature	Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min.	
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude, 80 min. each in X,Y,and Z directions	
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down,left/right,forward/backward)	
Degree of protection	IEC60529, IP40P	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx. 200 g (unit only: Approx.135 g)	
Materials	Case: PBT(polybutylene terephtahalate), Cover: Polycarbonate, Display: Acrylic resin, Button: Polyacetal, Cable: PVC	
Accessories	Instruction sheet	

*1 In the case of Omron's standard target object (white ceramic)
*2 Configure current output (4 to 20mA) and voltage output (±5V or 1 to 5V) by MENU mode.
*3 Calculating unit (ZX2-CAL) is necessary.

Calculating unit

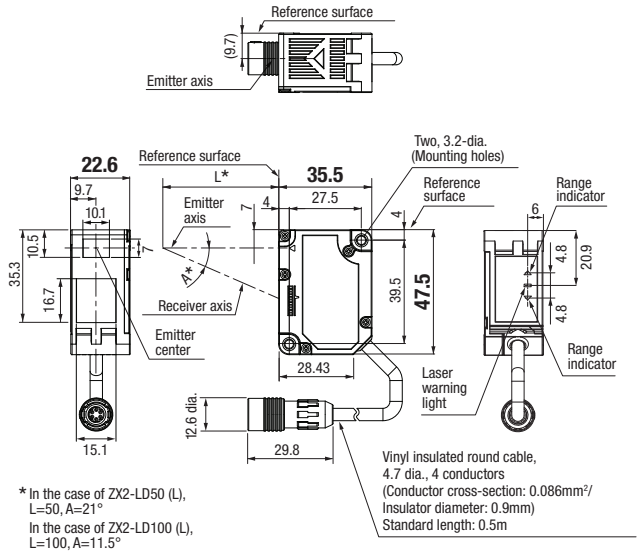
Item	ZX2-CAL
Applicable amplifier units	ZX2-LDA11/ZX2-LDA41
Current consumption	12 mA max. (supplied from the smart sensor amplifier unit)
Ambient temperature	Operating: 0 to +50°C, storage: -15 to +70°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35 to 85% RH (with no condensation)
Connection method	Connector
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Insulation resistance	100 MΩ (at 500 VDC)
Vibration resistance (destructive)	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions
Shock resistance (destructive)	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)
Materials	Case: PBT (polybutylene terephthalate), Display: Acrylic resin
Weight (packed state)	Approx. 50 g
Accessories	Instruction sheet

Dimensions

Units

Sensor heads

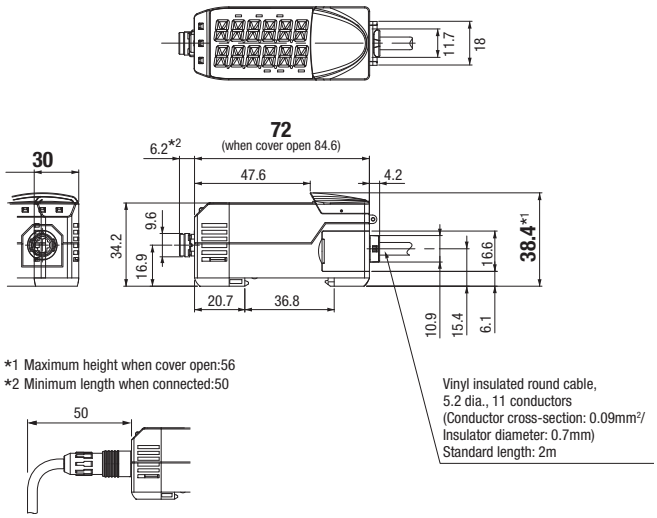
ZX2-LD50/ZX2-LD50L/ZX2-LD100/ZX2-LD100L



* In the case of ZX2-LD50 (L), L=50, A=21°
In the case of ZX2-LD100 (L), L=100, A=11.5°

Amplifier units

ZX2-LDA11/ZX2-LDA41

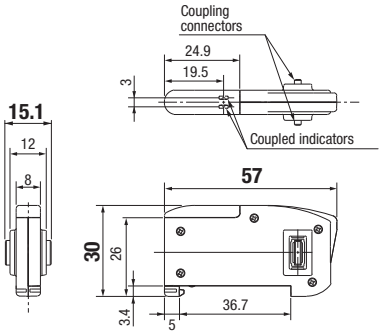


*1 Maximum height when cover open:56
*2 Minimum length when connected:50

Accessories

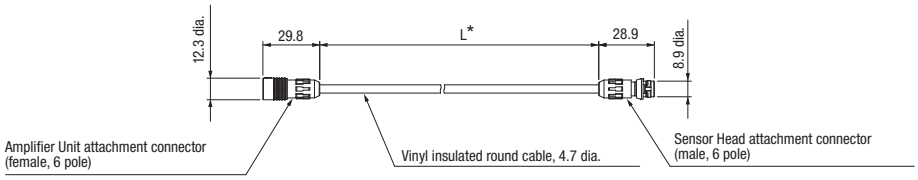
Calculating unit

ZX2-CAL



Sensor head extension cables

ZX2-XC1R/ZX2-XC4R/ZX2-XC9R



* Length L is as follows. ZX2-XC1R:1m, ZX2-XC4R:4m, ZX2-XC9R:9m

Smart, fast and accurate laser measurement sensor

Smart ZX-L-N offers plug & measure technology for applications where high resolution and fast response time is required. A wide range of interchangeable sensor heads provides greater flexibility in solving most demanding applications.

- Small and light sensor heads for easy integration
- High speed response time of 150 µs
- Easy sensor head replacement
- Scalability through a modular platform concept
- Multipoint measurement with up to 5 sensors
- Wide range of sensor heads offering laser beam width from 1 mm to 30 mm

Ordering information

Sensors

Sensor head (reflection type)

Optical method	Beam shape	Sensing distance	Resolution *1	Size in mm (HxWxD)	Order code
Diffuse-reflective	Spot beam	40±10 mm	2 µm	39x33x17	ZX-LD40
		100±40 mm	16 µm		ZX-LD100
		300±200 mm	300 µm		ZX-LD300
	Line beam	40±10 mm	2 µm		ZX-LD40L
		100±40 mm	16 µm		ZX-LD100L
		300±200 mm	300 µm		ZX-LD300L
Regular reflection type	Spot beam	30±2 mm	0.25 µm	45x55x25	ZX-LD30V
	Line beam				ZX-LD30VL

*1 At average count of 4,096 times

Sensor head (through-beam)

Optical method	Measurement width	Sensing distance	Resolution *1	Size in mm (HxWxD)		Order code
				Transmitter	Receiver	
Through-beam	1 mm dia.	0 to 2,000 mm	4 µm	15x15x34	15x15x19	ZX-LT001
	5 mm	0 to 500 mm				ZX-LT005
	10 mm			20x20x42	20x20x25	ZX-LT010
	30 mm		12 µm	64.25x70x22.6	64.25x54x22.6	ZX-LT030

*1 At average count of 64 times

Amplifier units

Power supply	Output specifications	Order code
DC	NPN output	ZX-LDA11-N
	PNP output	ZX-LDA41-N

Note: Compatible with sensor head connection.

Accessories (order separately)

Calculating unit

	Order code
Calculating unit	ZX-CAL2

Side-view attachments

Applicable sensor head	Order code
ZX-LT1001/LT005	ZX-XF12
ZX-LT010	ZX-XF22

SmartMonitor sensor setup tool for Personal Computer connection

Name	Order code
ZX-series communications interface unit	ZX-SF11
ZX-series communications interface unit + Setup Software (CD-ROM)	ZX-SFW11EV3*1,*2
ZX-series sensor setup and logging software (CD-ROM)	ZX-SW11EV3*1

*1 When using the ZX-TDA11/41 with the SmartMonitor, either the ZX-SFW11EV3 or the ZX-SW11EV3 SmartMonitor must be used. Earlier versions cannot be used.
*2 The ZX-SFW11EV3 SmartMonitor can be used only to set functions and monitor waveforms.

Cables with connectors on both ends (for extension)*1

Cable length	Order code
1 m	ZX-XC1A
4 m	ZX-XC4A
8 m	ZX-XC8A
9 m*2.	ZX-XC9A

*1. Robot cable models are also available. The model numbers are ZX-XC_R.
*2. For use only with reflective sensors.

Specifications

Sensor head (reflection type)

Item	ZX-LD40	ZX-LD100	ZX-LD300	ZX-LD30V	ZX-LD40L	ZX-LD100L	ZX-LD300L	ZX-LD30VL
Optical method	Diffuse reflection			Regular reflection	Diffuse reflection			Regular reflection
Light source (wave length)	Visible-light semiconductor laser (wavelength 650 nm, 1 mW or less, Class 2)							
Measurement center distance	40 mm	100 mm	300 mm	30 mm	40 mm	100 mm	300 mm	30 mm
Measurement range	±10 mm	±40 mm	±200 mm	±2 mm	±10 mm	±40 mm	±200 mm	±2 mm
Beam shape	Spot				Line			
Beam diameter *1	50 µm dia.	100 µm dia.	300 µm dia.	75 µm dia.	75 µmx2mm	150 µmx2 mm	450 µmx2 mm	100 µmx1.8 mm
Resolution*2	2 µm	16 µm	300 µm	0.25 µm	2 µm	16 µm	300 µm	0.25 µm
Linearity*3	±0.2% F.S. (entire range)	±0.2% F.S. (80 to 121 mm)	±2% F.S. (200 to 401 mm)	±0.2% F.S. (entire range)	±0.2% F.S. (32 to 49 mm)	±0.2% F.S. (80 to 121 mm)	±2% F.S. (200 to 401 mm)	±0.2% F.S. (entire range)
Temperature characteristic*4	±0.03% FS/°C (except for ZX-LD300 and ZX-LD300L, which are ±0.1% FS/°C.)							
Ambient illumination	Incandescent lamp: 3,000 lx max. (on light receiving side)							
Ambient temperature	Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)							
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)							
Insulation resistance	20 MΩ min. at 500 VDC							
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min							
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions							
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)							
Protective structure	IEC 60529 IP50			IEC standard IP40	IEC 60529 IP50			IEC standard IP40
Connection method	Connector relay (standard cable length: 500 mm)							
Weight (packed state)	Approx. 150 g			Approx. 250 g	Approx. 150 g			Approx. 250 g
Materials	Case: PBT (polybutylene terephthalate), Cover: Aluminum, lens: Glass			Case and cover: Aluminum, lens: Glass	Case: PBT (polybutylene terephthalate), Cover: Aluminum, lens: Glass			Case and cover: Aluminum, lens: Glass
Accessories	Instruction sheet, Laser warning label (English)							

*1 Beam diameter: This is the value of the measurement center distance (actual value), and is defined at 1/e^2 (13.5%) of the central light intensity. If there is stray light outside, the defined area and the area around the object has a higher reflectance than the object.
*2 Resolution: Indicates the amount of fluctuation (±3 δ) in the linear output when connected to the ZX-LDA. (The measured value when the average count of the ZX-LDA is set to 4,096 and our standard object (white ceramic) is used for the central distance.) This indicates the repeatability precision when the work is in a static state, and does indicate the distance precision. The resolution performance may not be satisfactory in a strong electromagnetic field.
*3 Linearity: This indicates the error with respect to the ideal straight line of the displacement output when measuring our standard object.
*4 Temperature characteristic: The temperature characteristic is measured at the measurement point with the sensor and reference object (Omron's standard reference object) secured with an aluminum jig.

Note: Highly reflective objects can result in incorrect detection by causing out-of-range measurements.

Sensor head (through-beam)

Item		ZX-LT001		ZX-LT005	ZX-LT010	ZX-LT030
Optical method		Through-beam				
Light source (wave length)		Visible-light semiconductor laser (wavelength 650 nm, 1 mW or less, Class 1)				
	Maximum output	0.2 mW max.		0.35 mW max.		0.2 mW max.
Measurement width		1 mm dia.	1 to 2.5 mm dia.	5 mm	10 mm	30 mm
Sensing distance		0 to 500 mm	500 to 2,000 mm	0 to 500 mm		
Min. sensing object		8 mm dia. opaque object	8 to 50 µm opaque object	opaque: 0.05 mm dia.	opaque: 0.1 mm dia.	opaque: 0.3 mm dia.
Resolution*1		4 µm*2	–	4 µm*3		12 µm*4
Temperature characteristic		±0.2% FS/°C				±0.3% FS/°C
Ambient illumination		Incandescent lamp: 10,000 lx max. (on light-receiving side)				
Ambient temperature		Operating: 0 to 50°C, storage: -25 to 70°C (with no icing or condensation)				
Ambient humidity		Operating: 35% to 85% (with no condensation)				
Protective structure		IEC 60529 IP40				IP 40
Connection method		Connector relay (standard cable length: 500 mm)				
Weight (packed state)		Approx. 220 g				Approx. 450 g
Cable length		Extendable up to 10 m with special extension cable.				
Materials	Case	Polyetherimide				Zinc die-cast
	Cover	Polycarbonate				
	Front filter	Glass				
Tightening torque		0.3 Nm max.				
Accessories		Instruction sheet, sensor head-amplifier connection cable				
		Optical axis adjustment seal				Mounting Bracket

*1 The amount of fluctuation (±3 δ) of the linear output when connected to an amplifier unit, converted to a detection span.
*2 When the average count is 64. 5 µm when the count is 32. The value when the smallest detection object shades the vicinity of the center of the 1 mm dia. detection span.
*3 When the average count is 64. 5 µm when the count is 32.
*4 For an average count of 64. The value is 15 µm for an average count of 32.

Amplifier units

Item	ZX-LDA11-N	ZX-LDA41-N
Measurement period	150 μs	
Possible average count settings*1	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096	
Temperature characteristic	When connected to a reflective sensor head: 0.01% FS/°C, when connected to a through-beam sensor head: 0.1% FS/°C	
Linear output*2	4 to 20 mA/FS, max. load resistance: 300 Ω, ±4 V (± 5 V, 1 to 5 V *3), output impedance: 100 Ω	
Judgement outputs (3 outputs: HIGH/PASS/LOW)*1	NPN open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 1.2 V max.	PNP open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 2 V max.
Laser OFF input, zero reset input, timing input, reset input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)
Functions	Measurement value display, present value/set value/light level/resolution display, scaling, display reverse, display OFF mode, ECO mode, number of display digit changes, sample hold, peak hold, bottom hold, peak-to-peak hold, self-peak hold, self-bottom hold, average hold, delay hold, intensity mode, zero reset, initial reset, ON-delay timer, OFF-delay timer, one-shot timer, deviation, previous value comparison, sensitivity adjustment, keep/clamp switch, direct threshold value setting, position teaching, 2-point teaching, automatic teaching, hysteresis width setting, timing inputs, reset input, monitor focus, linear output compensation, (A-B) calculations*4, (A+B) calculations*4, mutual interference*4, laser deterioration detection, zero reset memory, zero reset display, key lock	
Indications	Operation indicators: High (orange), pass (green), low (yellow), 7-segment main display (red), 7-segment subdisplay (yellow), laser ON (green), zero reset (green), enable (green)	
Power supply voltage	12 to 24 VDC ±10%, Ripple (p-p): 10% max.	
Current consumption	140 mA max. with power supply voltage of 24 VDC (with sensor connected)	
Ambient temperature	Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Insulation resistance	20 MΩ min. at 500 VDC	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance (destruction)	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions	
Shock resistance (destruction)	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx. 350 g	
Materials	Case: PBT (polybutylene terephthalate), cover: Polycarbonate	
Accessories	Instruction sheet	

*1 The response speed of the linear output is calculated as the measurement period x (average count setting + 1) (with fixed sensitivity).
The response speed of the judgement outputs is calculated as the measurement period x (average count setting + 1) (with fixed sensitivity).
*2 The output can be switched between a current output and voltage output using a switch on the bottom of the amplifier unit.
*3 Setting is possible via the monitor focus function.
*4 A calculating unit (ZX-CAL2) is required.

Calculating unit

Item	ZX-CAL2
Applicable amplifier units	ZX-LDA11-N/41-N/ZX-EDA11/41/ZX-TDA11/41
Current consumption	12 mA max. (supplied from the smart sensor amplifier unit)
Ambient temperature	Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)
Connection method	Connector
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min
Insulation resistance	100 MΩ (at 500 VDC)
Vibration resistance (destructive)	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions
Shock resistance (destructive)	300 m/s^2 3 times each in six directions (up/down, left/right, forward/backward)
Materials	Display: Acrylic, case: ABS resin
Weight (packed state)	Approx. 50 g

ZX-series Communications Interface Unit

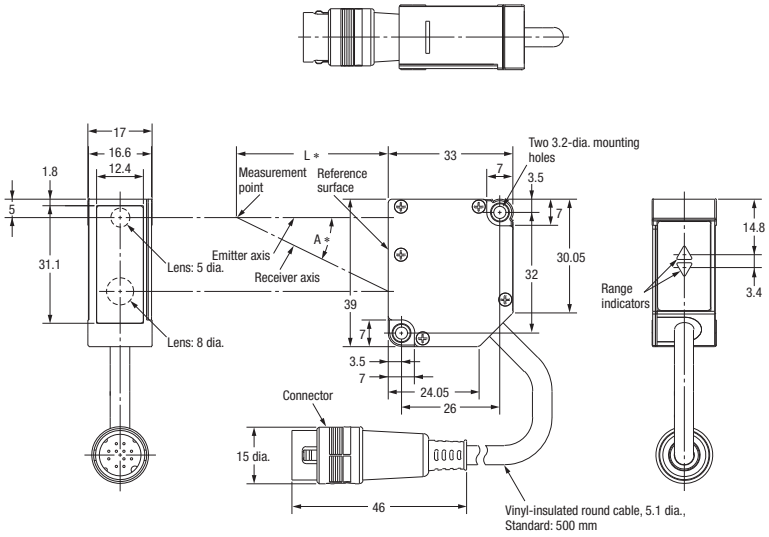
Item		ZX-SF11
Current consumption		60 mA max. (supplied by the amplifier unit)
Applicable amplifier units		ZX series
Applicable amplifier unit versions		ZX-LDA_1-N Ver. 1.000 or higher ZX-EDA_1 Ver. 1.100 or higher ZX-TDA_1 Ver. 1.000 or higher
Max. No. of amplifier units		5
Communications functions	Communications port	RS-232C port (9-pin D-Sub connector)
	Communications protocol	CompoWay/F*1
	Baud rate	38,400 bps
	Data configuration	Data bits: 8, parity: none, start bits: 1, stop bits: 1, flow control: none
Indicators		Power supply: green, sensor communications: green, sensor communications error: red, external terminal communications: green, external terminal communications error: red
Protective circuits		Reverse polarity protection
Ambient temperature		Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)
Ambient humidity		Operating and storage: 35% to 85% (with no condensation)
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min, Leakage current: 10 mA max.
Materials		Case: PBT (polybutylene terephthalate), cover: Polycarbonate
Accessories		Instruction sheet, 2 clamps

*1 Contact your Omron representative for CompoWay/F communications specifications.

Dimensions

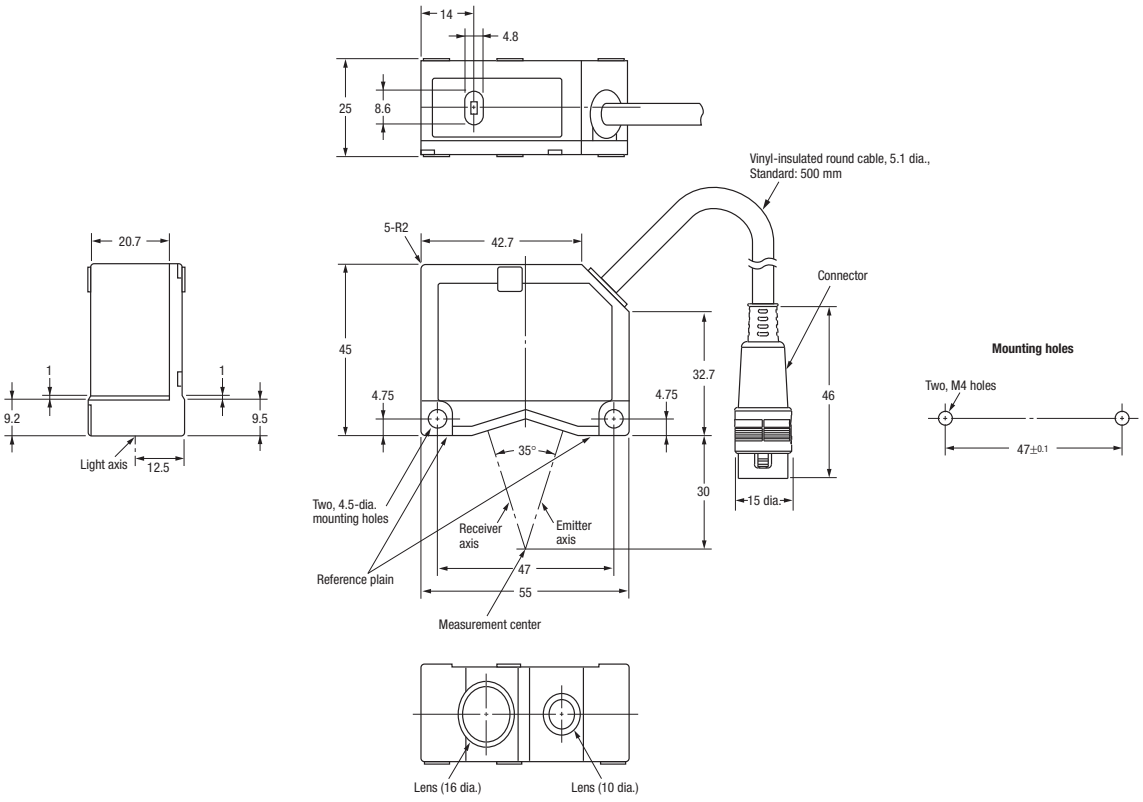
Sensor heads (diffuse reflective)

ZX-LD40/ZX-LD100/ZX-LD300/ZX-LD40L/ZX-LD100L/ZX-LD300L



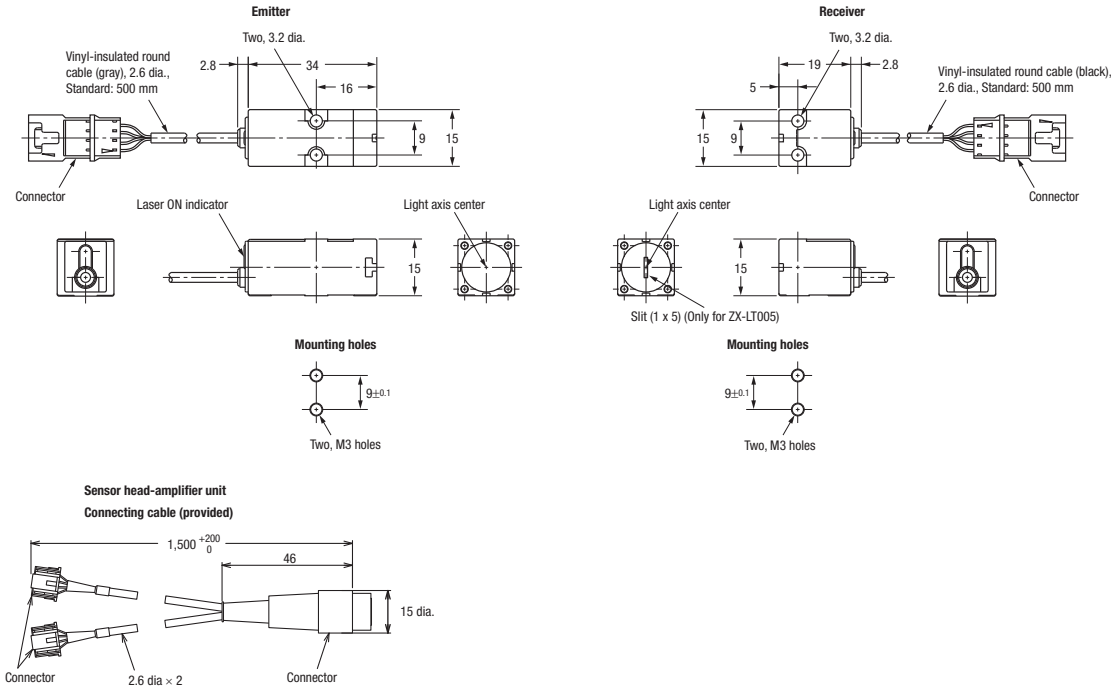
Sensor heads (regular reflective)

ZX-LD30V/ZX-LD30VL

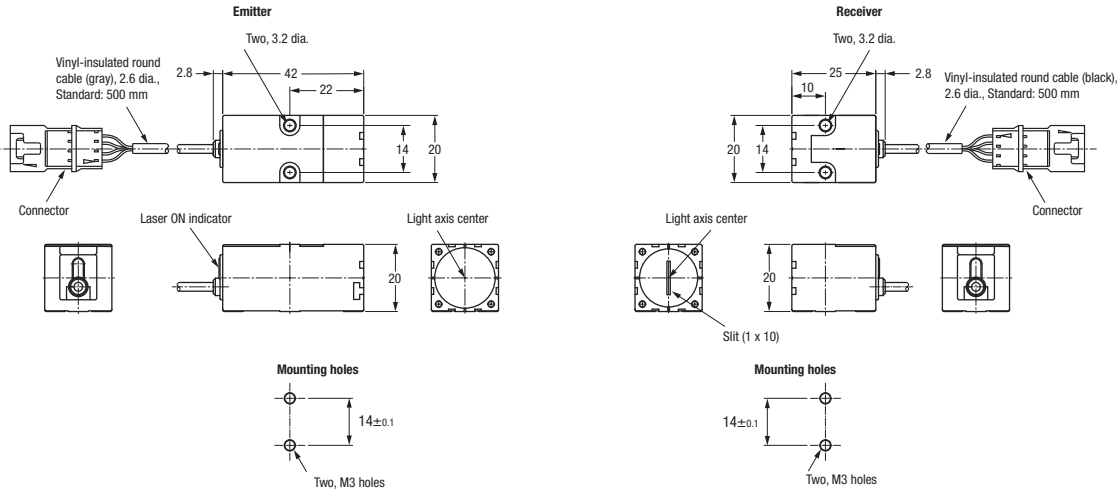


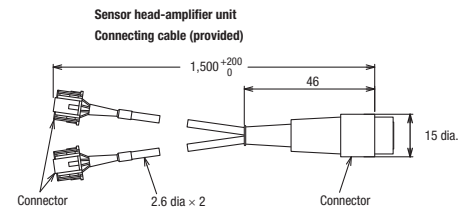
Sensor heads (throug-beam)

ZX-LT001/ZX-LT005

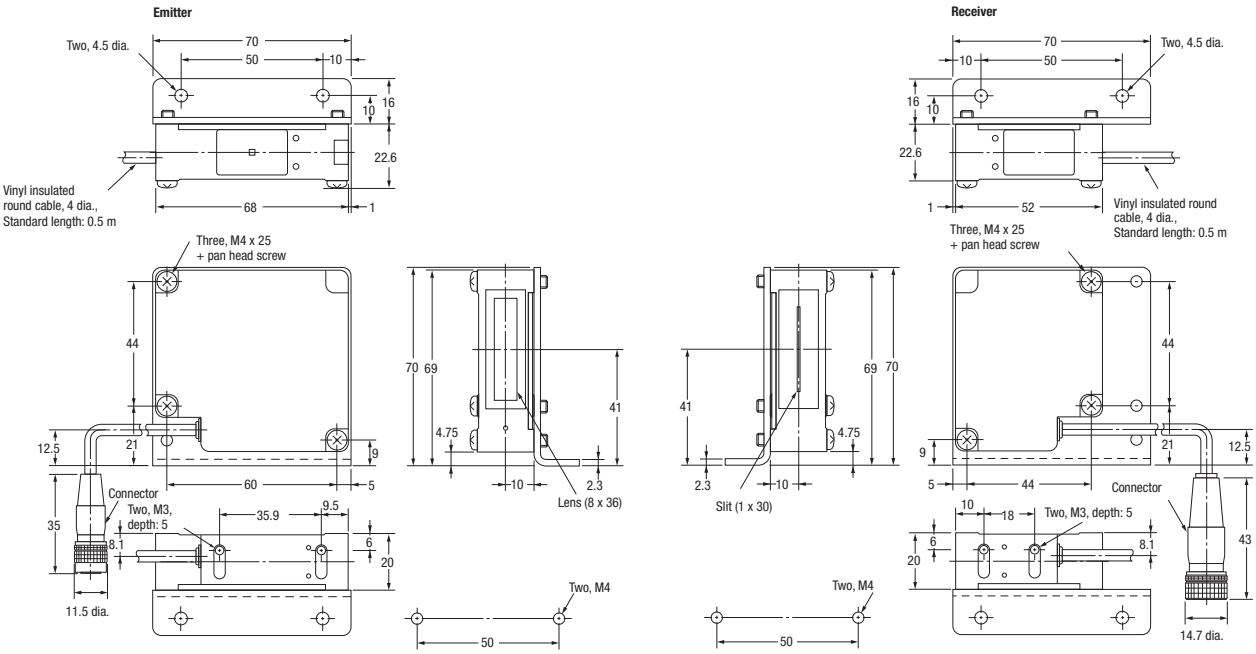


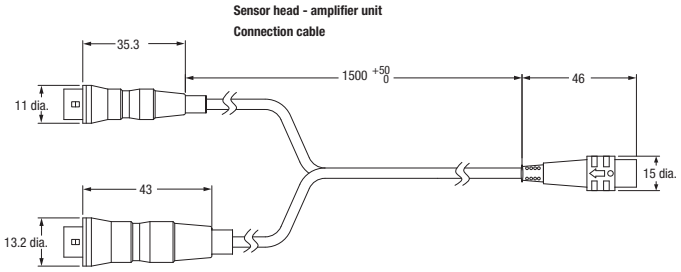
ZX-LT010





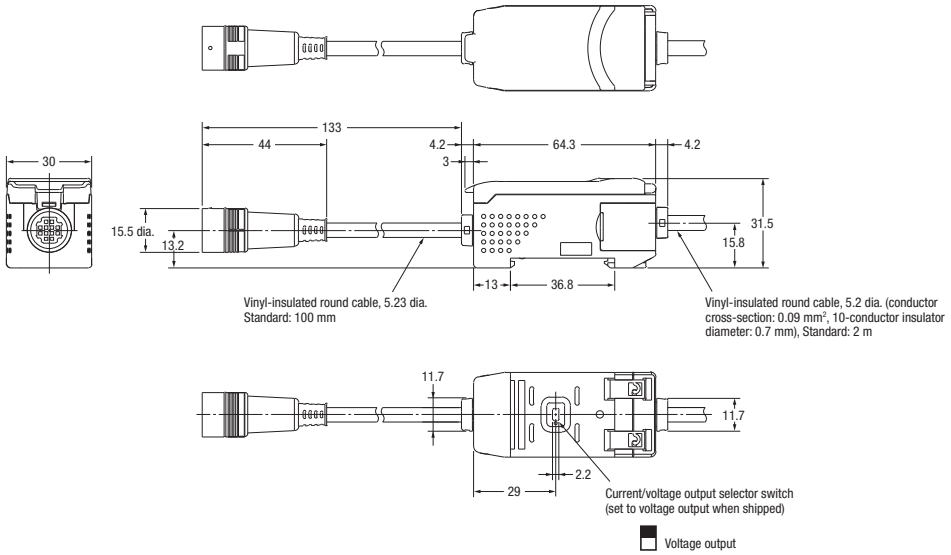
ZX-LT030





Amplifier units

ZX-LDA11-N/ZX-LDA41-N



Smart inductive measurement sensor

ZX-E offers the best solution for the accurate measurement of metallic objects. It is highly recommended in harsh environments such as automotive and metal working machines.

- High resolution of 1 µm
- High-speed response time of 150 µs
- Easy sensor head replacement
- Modular platform concept for different sensing technologies
- Easy linearity adjustment for any metal

Ordering information

Sensors

Sensor heads

Shape	Dimensions	Sensing distance	Resolution*1	Order code
Cylindrical	3 dia. x 18 mm	0.5 mm	1 µm	ZX-EDR5T
	5.4 dia. x 18 mm	1 mm		ZX-ED01T *2
	8 dia. x 22 mm	2 mm		ZX-ED02T *2
Screw-shaped	M10x22 mm	2 mm		ZX-EM02T *2
	M18x46.3 mm	7 mm		ZX-EM07MT *2
Flat	30x14x4.8 mm	4 mm		ZX-EV04T *2,*3
Heat-resistant, cylindrical	M12x22 mm	2 mm		ZX-EM02HT*4

*1 For an average count of 4,096.
*2 Models with protective spiral tubes are also available. Add a suffix of "-S" to the above model numbers when ordering. (Example: ZX-ED01T-S)
*3 Be sure to use ZX-EDA amplifier unit version 1,200 or later with the ZX-EV04.
*4 Be sure to use ZX-EDA amplifier unit version 1,300 or later with the ZX-EM02H.

Amplifier units

Power supply	Output type	Order code
DC	NPN	ZX-EDA11
	PNP	ZX-EDA41

Note: Compatible connection with the sensor head.

Accessories (order separately)

Calculating unit

	Model
Calculating unit	ZX-CAL2

Amplifier mounting brackets

Remarks	Model
Attached to each sensor head	ZX-XBE1
For DIN track mounting	ZX-XBE2

SmartMonitor sensor setup tool for Personal Computer connection

Name	Model
ZX-series communications interface unit	ZX-SF11
ZX-series communications interface unit + setup software (CD-ROM)	ZX-SFW11EV3*1
ZX-series sensor setup and logging software (CD-ROM)	ZX-SW11EV3

*1 The ZX-SFW11EV3 SmartMonitor can be used only to set functions and monitor waveforms.

Cables with connectors on both ends (for extension)*

Cable length	Model
1 m	ZX-XC1A
4 m	ZX-XC4A
8 m	ZX-XC8A

* Robot cable models are also available. The model numbers are ZX-XC_R.

Specifications

Sensor heads

Item		ZX-EDR5T	ZX-ED01T	ZX-ED02T/EM02T	ZX-EM07MT	ZX-EV04T	ZX-EM02HT
Measurement range		0 to 0.5 mm	0 to 1 mm	0 to 2 mm	0 to 7 mm	0 to 4 mm	0 to 2 mm
Sensing object		Magnetic metals (Measurement ranges and linearities are different for non-magnetic metals. Refer to engineering data on B-67.)					
Standard reference object		18x18x3 mm		30x30x3 mm	60x60x3 mm		45x45x3 mm
		Material: Ferrous (S50C)					
Resolution *1		1 µm					
Linearity *2		±0.5% F.S.					±1% F.S. *3
Linear output range		Same as measurement range.					
Temperature characteristic *4 (including amplifier unit)		0.15% F.S./°C	0.07% F.S./°C				0.1% F.S./°C
Ambient temperature	Operating *5	0 to 50°C (with no icing or condensation)	-10 to 60°C (with no icing or condensation)				-10 to 200°C
	Storage *5		-20 to 70°C (with no icing or condensation)				-20 to 200°C

Item			ZX-EDR5T	ZX-ED01T	ZX-ED02T/EM02T	ZX-EM07MT	ZX-EV04T	ZX-EM02HT
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)					
Insulation resistance			50 MΩ min. (at 500 DC)					
Dielectric strength			1,000 VAC, 50/60 Hz for 1 min between charged parts and case					
Vibration resistance (destruction)			10 to 55 Hz with 1.5-mm double amplitude for 2 h each in X, Y, and Z directions					
Shock resistance (destruction)			500 m/s^2, 3 times each in X, Y, and Z directions					
Degree of protection (sensor head)			IEC60529, IP65	IEC60529, IP67				IEC60529, IP60 *6
Connection method			Connector relay (standard cable length: 2 m)					
Weight (packed state)			Approx. 120 g	Approx. 140 g		Approx. 160 g	Approx. 130 g	Approx. 160 g
Materials	Sensor head	Case	Brass	Stainless steel	Brass		Zinc (nickel-plated)	Brass
		Sensing surface	Heat-resistant ABS					PEEK
	Preamplifier		PES					
Accessories			Amplifier mounting brackets (ZX-XBE1), instruction manual					

*1 Accuracy: The resolution is the deviation (±3σ) in the linear output when connected to the ZX-EDA amplifier unit. The above values indicate the deviations observed 30 minutes after the power is turned ON.
(The resolution is measured with Omron's standard reference object at ½ of the measurement range with the ZX-EDA set for the maximum average count of 4,096 per period.)
The resolution is given at the repeat accuracy for a stationary workpiece, and is not an indication of the distance accuracy. The resolution may be adversely affected under strong electromagnetic fields.
*2 Linearity: The linearity is given as the error in an ideal straight line displacement output when measuring the standard reference object. The linearity and measurement values vary with the object being measured.
*3 The value given is for an ambient temperature of 25°C.
*4 Temperature characteristic: The temperature characteristic is measured with Omron's standard reference object at ½ of the measurement range.
*5 The ambient temperature given is only for the sensor head. It is -10 to 60°C for the preamp.
*6 Do not use in moist environments because the case is not waterproof.

Amplifier units

Item	ZX-EDA11	ZX-EDA41
Measurement period	150 µs	
Possible average count settings *1	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1,024, 2,048, or 4,096	
Linear output *2	Current output: 4 to 20 mA/F.S., max. load resistance: 300 Ω Voltage output: ±4 V (±5 V, 1 to 5 V *3), output impedance: 100 Ω	
Judgement outputs (3 outputs: HIGH/PASS/LOW)	NPN open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 1.2 V max.	PNP open-collector outputs, 30 VDC, 50 mA max. Residual voltage: 2 V max.
Zero reset input, timing input, reset input, judgement output hold input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage within 1.5 V OFF: Open (leakage current: 0.1 mA max.)
Function	- Measurement value display - Linearity adjustment (materials selection) - Display reverse - Number of display digit changes - Bottom hold, peak-to-peak hold - Average hold - Initial reset - OFF-delay timer - Non-measurement setting - Automatic teaching - Reset input - Linear output correction - K-(A+B) calculation *4 - Sensor disconnection detection - Key lock - set value/output value/ resolution display - display OFF mode - sample hold - self-peak hold - delay hold - linearity initialization - one-shot timer - direct threshold value setting - hysteresis width setting - judgement output hold input - (A-B) calculations *4 - mutual interference prevention *4 - zero reset memory - Scaling - ECO mode - peak hold - self-bottom hold - zero reset - ON-delay timer - previous value comparison - position teaching - timing inputs - monitor focus - (A+B) calculations *4 - zero reset indicator	
Indications	Judgement indicators: High (orange), pass (green), low (yellow), 7-segment main digital display (red), 7-segment sub-digital display (yellow), power ON (green), zero reset (green), enable (green)	
Voltage influence (including sensor)	0.5% F.S. of linear output value at ±20% of power supply voltage	
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.	
Current consumption	140 mA max. with power supply voltage of 24 VDC (with sensor connected)	
Ambient temperature	Operating and storage: 0 to 50°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35% to 85% (with no condensation)	
Insulation resistance	20 MΩ min. (at 500 DC)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance (destruction)	10 to 150 Hz with 0.7-mm double amplitude for 80 min each in X, Y, and Z directions	
Shock resistance (destruction)	300 m/s^2, 3 times each in 6 directions (up, down, left, right, forward, backward)	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx. 350 g	
Materials	Case: PBT (polybutylene terephthalate), cover: Polycarbonate	
Accessories	Instruction manual	

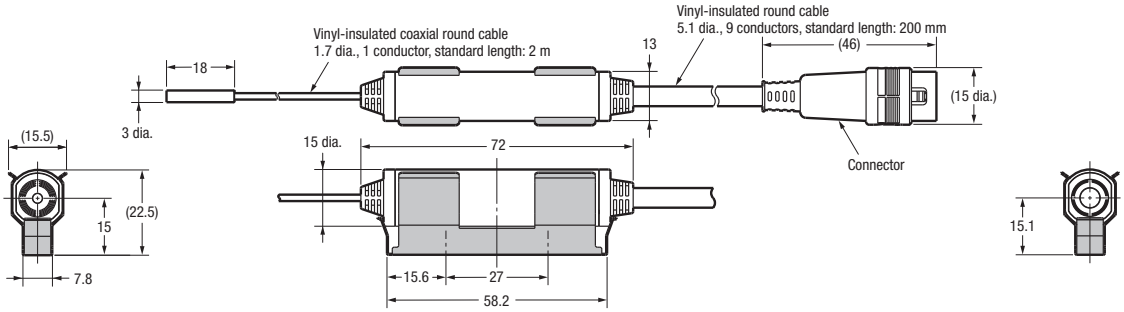
*1 The response speed of the linear output is calculated as the measurement period x (average count setting + 1) (with fixed sensitivity).
The response speed of the judgement outputs is calculated as the measurement period x (average count setting + 1) (with fixed sensitivity).
*2 The output can be switched between a current output and voltage output using a switch on the bottom of the amplifier unit.
*3 Setting is possible via the monitor focus function.
*4 A calculating unit (ZX-CAL or ZX-CAL2) is required.

Dimensions

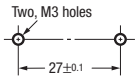
Sensor heads

ZX-EDR5T

Dimensions with mounting bracket attached

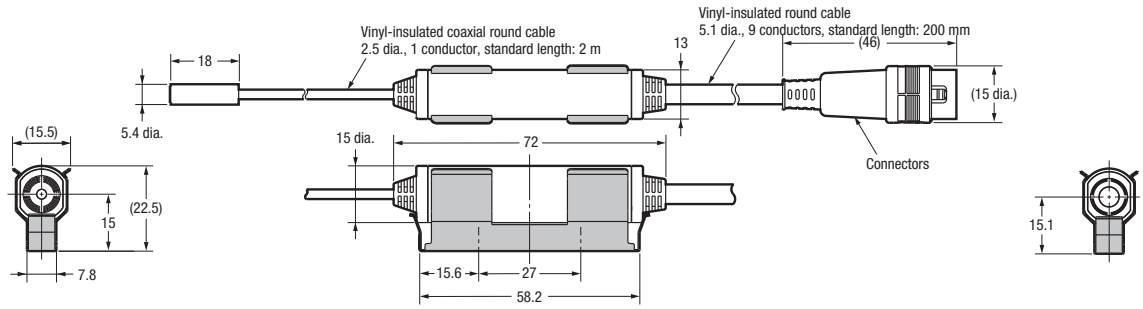


Mounting hole cutout dimensions

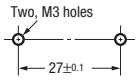


ZX-ED01T

Dimensions with mounting bracket attached

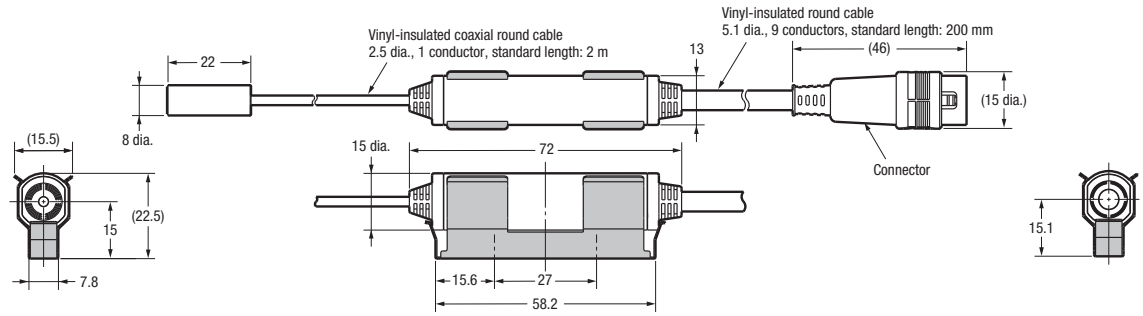


Mounting hole cutout dimensions

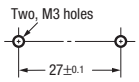


ZX-ED02T

Dimensions with mounting bracket attached

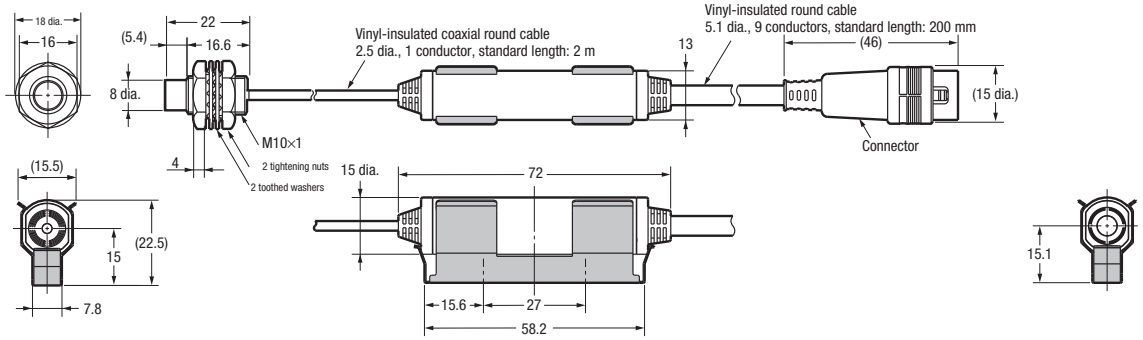


Mounting hole cutout dimensions

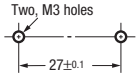


ZX-EM02T

Dimensions with mounting bracket attached

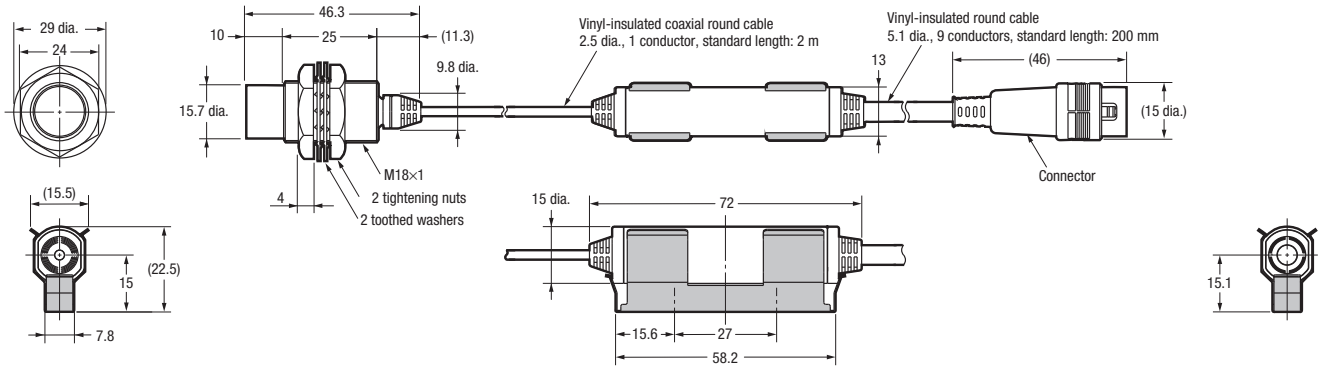


Mounting hole cutout dimensions

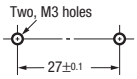


ZX-EM07MT

Dimensions with mounting bracket attached

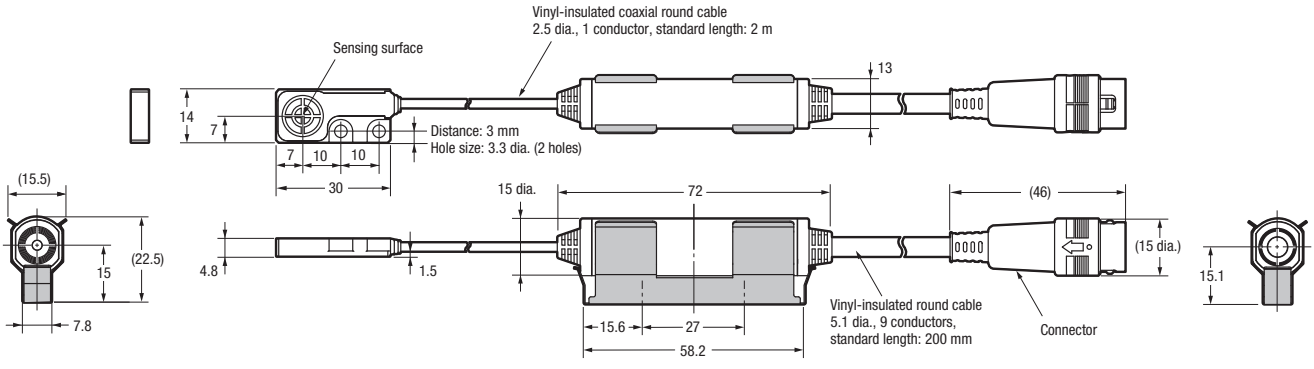


Mounting hole cutout dimensions

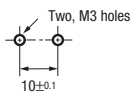


ZX-EV04T

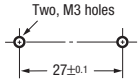
Dimensions with mounting bracket attached



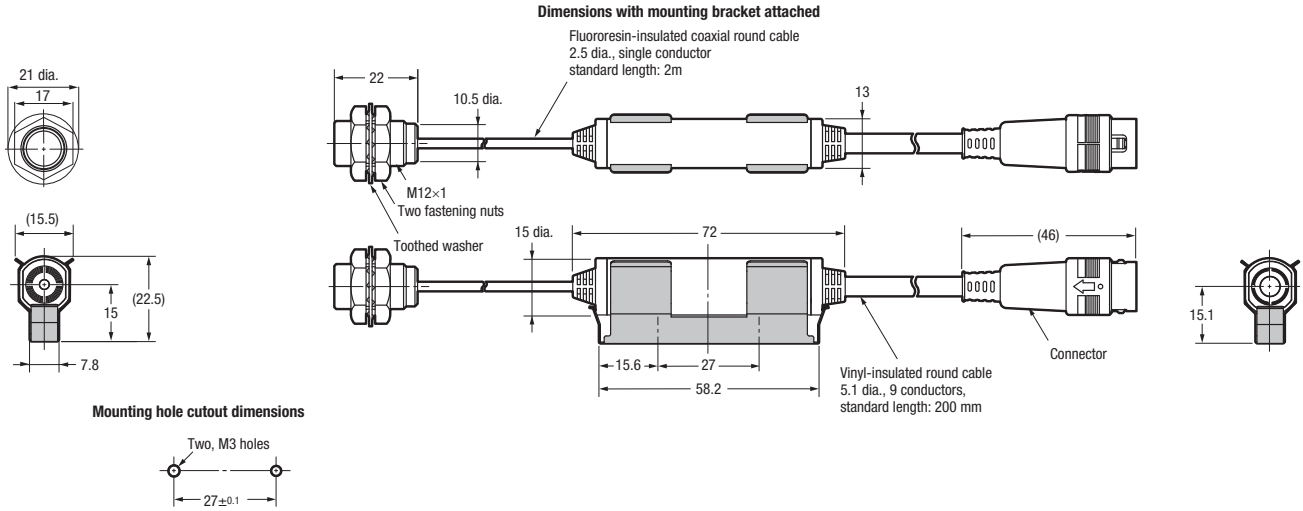
Mounting hole cutout dimensions



Mounting hole cutout dimensions

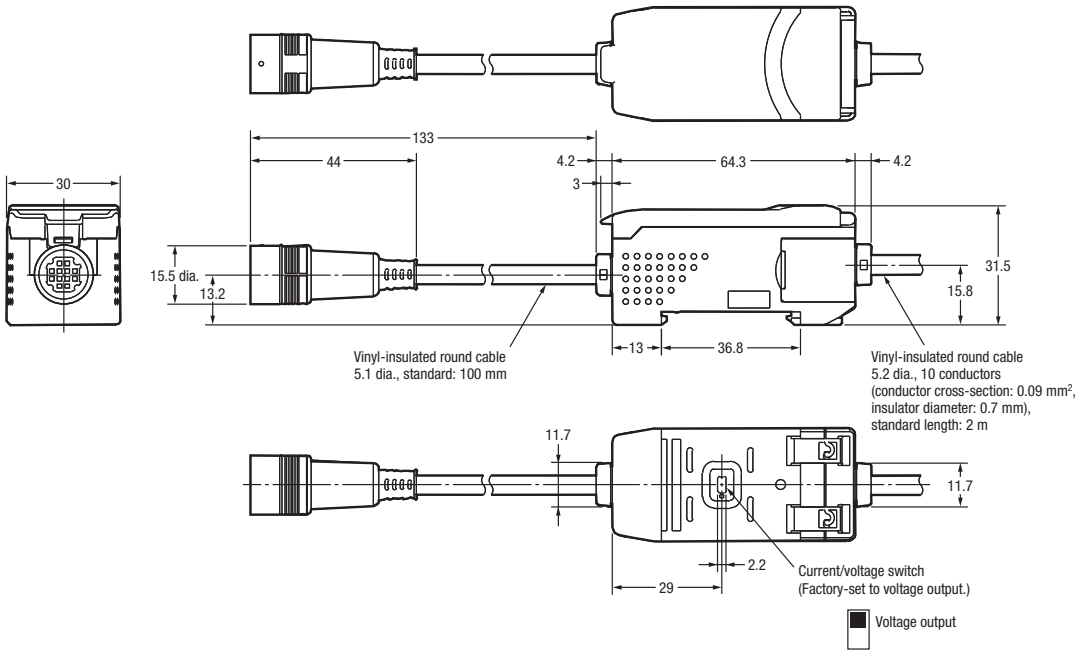


ZX-EM02HT



Amplifier units

ZX-EDA11/ZX-EDA41



Smart contact measurement sensor

ZX-T is ideal for applications where the target object may contain oil deposits or other micro-structures. In this case contact measurement is the most reliable way.

- Modular platform concept for different sensing technologies
- Air-retracting types for automated inspection
- Multipoint measurement with up to 8 sensors
- Pressing force alarm prevents malfunction
- Strong ball bearing structure assures long life time

Ordering information

Sensors

Sensor heads

Size	Type	Sensing distance	Resolution (See note.)	Order code
6 dia.	Short type	1 mm	0.1 µm	ZX-TDS01T
	Standard type	4 mm		ZX-TDS04T
	Low-load type			ZX-TDS04T-L
8 dia.	Standard type	10 mm	0.4 µm	ZX-TDS10T
	Ultra-low-load type			ZX-TDS10T-L
	Air lift type			ZX-TDS10T-V
	Air lift/air push type			ZX-TDS10T-VL

Note: The resolution refers to the minimum value that can be read when a ZX-TDA_1 amplifier unit is connected.

Amplifier units

Power supply	Output type	Order code
DC	NPN	ZX-TDA11
	PNP	ZX-TDA41

Accessories (order separately)

Calculating unit

	Order code
Calculating unit	ZX-CAL2

SmartMonitor sensor setup tool for Personal Computer connection

Name	Order code
ZX-series communications interface unit	ZX-SF11
ZX-series communications interface unit + setup software (CD-ROM)	ZX-SFW11EV3*1,*2
ZX-series sensor setup and logging software (CD-ROM)	ZX-SW11EV3*1

*1 When using the ZX-TDA11/41 with the SmartMonitor, either the ZX-SFW11EV3 or the ZX-SW11EV3 SmartMonitor must be used. Earlier versions cannot be used.
*2 The ZX-SFW11EV3 SmartMonitor can be used only to set functions and monitor waveforms.

ZX-series communications interface unit

Name	Order code
ZX-series communications interface unit	ZX-SF11

Cables with connectors on both ends (for extension)*

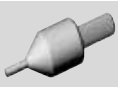
Cable length	Order code
1 m	ZX-XC1A
4 m	ZX-XC4A
8 m	ZX-XC8A

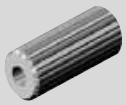
* Robot cable models are also available. The model numbers are ZX-XC_R.

Preamplifier mounting brackets

Remarks	Order code
Attached to each sensor head	ZX-XBT1
For DIN track mounting	ZX-XBT2

Actuators

Type (material)	Screw section	Appearance	Application	Applicable sensor (see note.)	Order code
				ZX-TDS_T	
Ball type (steel)	Female screw M2.5x0.45		Measuring ordinary flat surfaces (standard actuator supplied with the ZX-TDS series)	○	D5SN-TB1
Ball type (carbide steel)	Female screw M2.5x0.45		Measurements where abrasion resistance is critical Measured objects: Carbide (HR90) or lower.	○	D5SN-TB2
Ball type (ruby)	Female screw M2.5x0.45		Measurements where abrasion resistance is critical Measured objects: Carbide (HR90) or higher.	○	D5SN-TB3
Needle type (carbide steel)	Male screw M2.5x0.45		Measuring the bottom of grooves and holes	△	D5SN-TN1

Type (material)	Screw section	Appearance	Application	Applicable sensor (see note.)	Order code
				ZX-TDS_T	
Flat (carbide steel)	Male screw M2.5x0.45		Measuring spherical objects	△	D5SN-TF1
Conversion adapter (stainless steel)	Through-hole female screw M2.5x0.45		Mounting D5SN-TN1/-TF1 or commercially available actuators on ZX-TDS-series sensors	○	D5SN-TA

Note: ○ Replacement possible △ Conversion adapter required

Specifications

Amplifier units

Item	ZX-TDA11	ZX-TDA41
Measurement period	1 ms	
Possible average count settings *1	1, 16, 32, 64, 128, 256, 512, or 1,024	
Linear output *2	Current output: 4 to 20 mA/F.S., max. load resistance: 300 Ω Voltage output: ±4 V (±5 V, 1 to 5 V*3), output impedance: 100 Ω	
Judgement outputs (3 outputs: HIGH/PASS/LOW)	NPN open-collector outputs, 30 VDC, 30 mA max. Residual voltage: 1.2 V max.	PNP open-collector outputs, 30 VDC, 30 mA max. Residual voltage: 2 V max.
Zero reset input, timing input, reset input, judgement output hold input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage of 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)
Function	- Measurement value display - Display reverse - Sample hold - Self-peak hold - Initial reset - Hysteresis width setting - Judgement output hold input - (A+B) calculations (see note 4.) - Zero reset memory - Clamp value setting - Span adjustment	- present value/set value/output value display - ECO mode - peak hold - self-bottom hold - direct threshold value setting - timing inputs - monitor focus - sensor disconnection detection - function lock - scale inversion - warming-up display	- number of display digit changes - bottom hold, peak-to-peak hold - zero reset - position teaching - reset input - (A-B) calculations*4 - non-measurement setting - zero reset indicator - pressing force alarm
Indicators	Judgement indicators: High (orange), pass (green), low (yellow), 7-segment main digital display (red), 7-segment sub-digital display (yellow), power ON (green), zero reset (green), enable (green)	
Power supply voltage	12 to 24 VDC ±10%, ripple (p-p): 10% max.	
Current consumption	140 mA max. (with sensor connected), for 24-VDC power supply voltage: 140 mA max. (with sensor connected)	
Ambient temperature	Operating and storage: 0 to 50°C (with no icing or condensation)	
Temperature characteristic	0.03% F.S./°C	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx. 350 g	
Materials	Case: PBT (polybutylene terephthalate), cover: Polycarbonate	

*1 The response speed of the linear output is calculated as the measurement period x (average count setting + 1).
The response speed of the judgement outputs is calculated as the measurement period x (average count setting + 1).
*2 The output can be switched between a current output and voltage output using a switch on the bottom of the amplifier unit.
*3 Setting is possible via the monitor focus function.
*4 A calculating unit (ZX-CAL2) is required.

Sensor heads

Item		ZX-TDS01T	ZX-TDS04T	ZX-TDS04T-L
Measurement range		1 mm	4 mm	
Maximum actuator travel distance		Approx. 1.5 mm	Approx. 5 mm	
Resolution*1		0.1 µm		
Linearity*2		±0.3% F.S.		
Operating force *3		Approx. 0.7 N		Approx. 0.25 N
Degree of protection (sensor head)		IEC60529, IP67		IEC60529, IP54
Mechanical durability		10,000,000 operations min.		
Ambient temperature		Operating: 0 to 50°C, storage: -15 to 60°C (with no icing or condensation)		
Ambient humidity		Operating and storage: 35 to 85% (with no icing or condensation)		
Temperature characteristic *4	Sensor head	0.03% F.S./°C		
	Preamplifier	0.01% F.S./°C		
Weight (packed state)		Approx. 100 g		
Materials	Sensor head	Stainless steel		
	Preamplifier	Polycarbonate		
Accessories		Instruction manual, preamplifier mounting brackets (ZX-XBT1)		

*1 The resolution is given as the minimum value that can be read when a ZX-TDA_1 amplifier unit is connected. This value is taken 15 minutes after turning ON the power with the average number of operations set to 256.
*2 The linearity is given as the error in an ideal straight line displacement output.
*3 These figures are representative values that apply for the measurement mid-point, and are for when the provided actuator is used, with the actuator moving downwards. If the actuator moves horizontally or upwards, the operating force will be reduced. Also, if an actuator other than the standard one is used, the operating force will vary with the weight of the actuator itself.
*4 These figures are representative values that apply for the mid-point of the measurement range.

Sensor heads (long-range type)

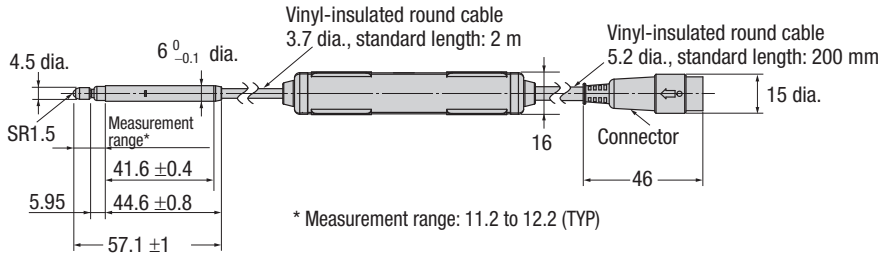
Item		ZX-TDS10T	ZX-TDS10T-V	ZX-TDS10T-L	ZX-TDS10T-VL
Vacuum retract (VR) and air push (AP) compatible		No	VR	No	VR/AP
Measurement range		10 mm			
Maximum actuator travel distance		10.5 mm			
Resolution*1,*2		0.4 µm			
Linearity*2,*3		±0.5% FS			
Operating force *4		Approx. 0.7 N	Approx. 0.6 N	Approx. 0.065 N	0.09 to 1.41N
Air pressure	Vacuum retrating	–	-0.55 to 0.70 (bar)	–	-0.05 to 0.22 (bar)
	Air push		–		0.125 to 2 (bar)
Degree of protection	Sensor head	IP65		IP50	
	Preamplifier	IP40			
Mechanical durability		10,000,000 operations min.			
Ambient temperature		Operating: 0 to 50°C, storage: -10 to 60°C (with no icing or condensation)			
Ambient humidity		Operating and storage: 35 to 85% (with no icing or condensation)			
Temperature characteristic*5	Sensor head	±0.01% FS/°C			
	Preamplifier	±0.01% FS/°C			
Vibration resistance		0.35 mm single amplitude at 10 to 55 Hz for 50 min each in the X, Y, and Z directions			
Shock resistance		150 m/s^2 3 times each in 6 directions (up/down, left/right, and forward/backward)			
Connection method		Prewired connector (2 m from the sensor head to the preamplifier, 0.2 m from the preamplifier to the connector)			
Weight (packed state)		Approx. 100 g			
Materials	Sensor head	Stainless steel			
	Rubber sleeve	Viton		None	
	Preamplifier	Polycarbonate			
	Mounting brackets	Stainless steel			
Accessories		Instruction manual, preamplifier mounting brackets (ZX-XBT1), right-angle adapter *6			

*1 The resolution is given as the minimum value that can be read when a ZX-TDA_1 amplifier unit is connected. This value is taken 15 minutes after turning ON the power with the average number of operations set to 256.
*2 These values were measured at an ambient temperature of 23°C.
*3 The linearity is given as the error in an ideal straight line displacement output.
*4 These figures are representative values that apply for the measurement mid-point, and are for when the provided actuator is used, with the actuator moving downwards. If the actuator moves horizontally or upwards, the operating force will be reduced. Also, if an actuator other than the standard one is used, the operating force will vary with the weight of the actuator itself.
*5 These figures are representative values that apply for the mid-point of the measurement range.
*6 The ZX-TDS10_ comes with a right-angle adapter.

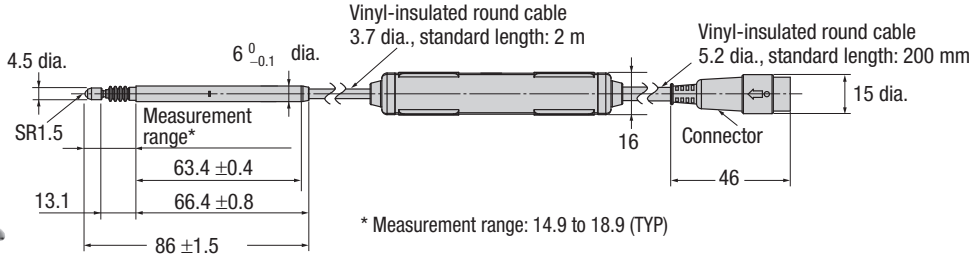
Dimensions

Sensors

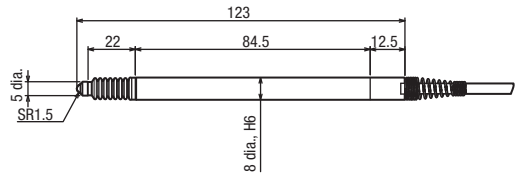
ZX-TDS01T



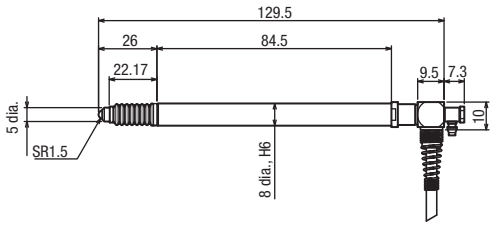
ZX-TDS04T/ZX-TDS04T-L



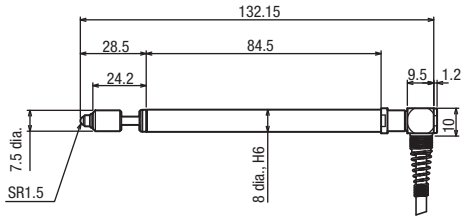
ZX-TDS10T



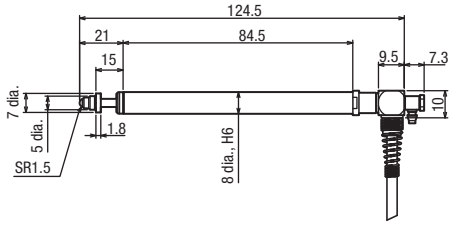
ZX-TDS10T-V



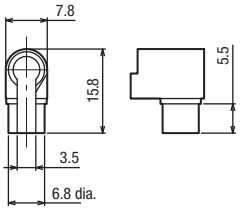
ZX-TDS10T-L



ZX-TDS10T-VL

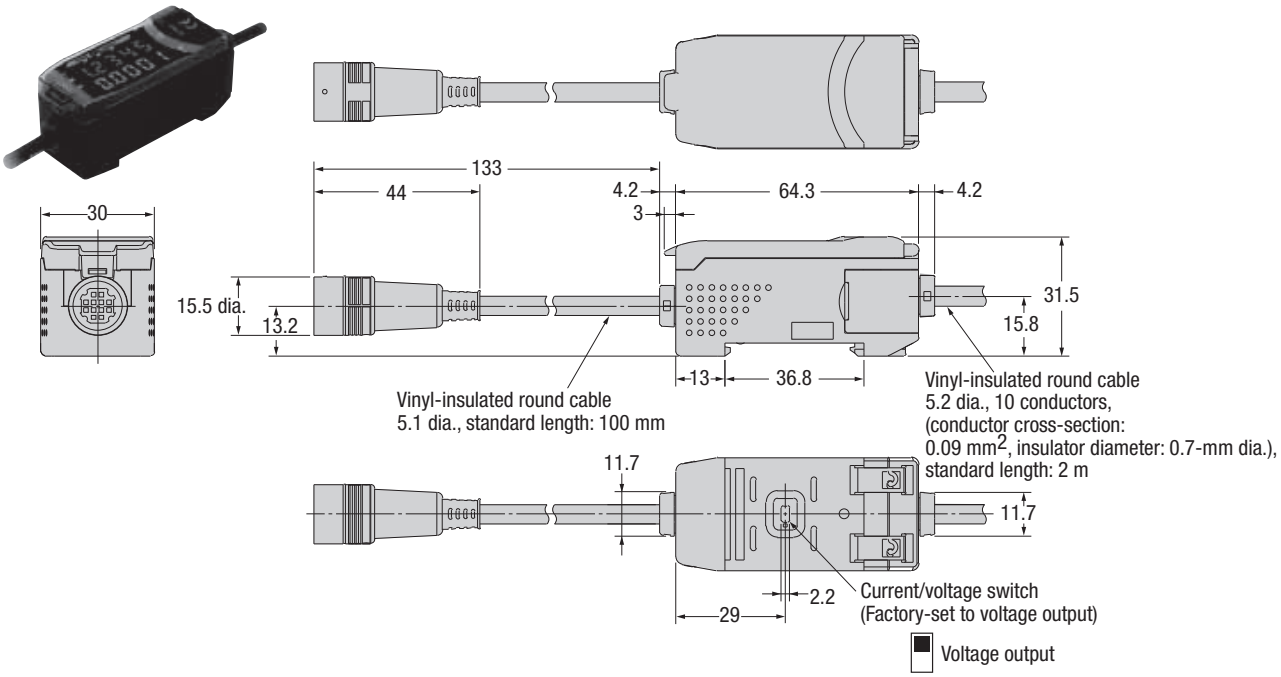


Right-angle adapter



Amplifier unit

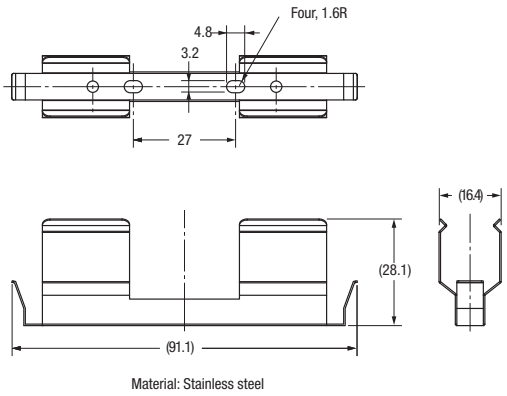
ZX-TDA11/ZX-TDA41



Accessories (order separately)

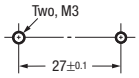
Preamplifier mounting bracket (supplied with each sensor)

ZX-XBT1

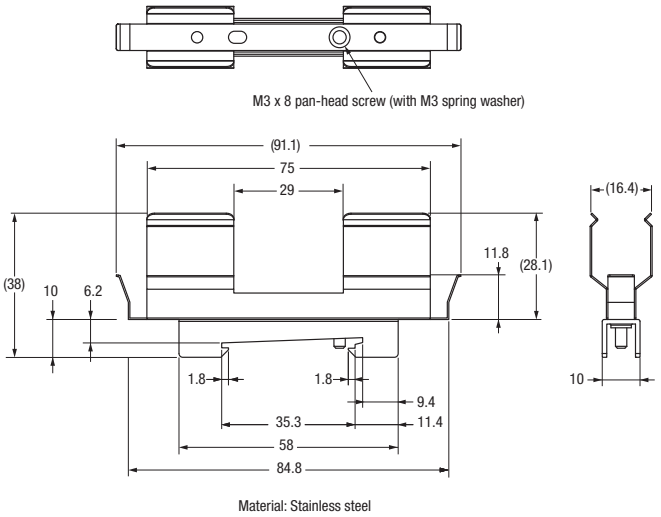


Material: Stainless steel

Mounting hole cutout dimensions



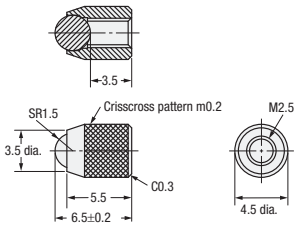
ZX-XBT2



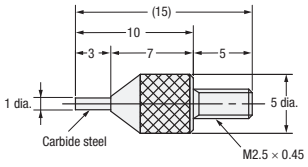
Material: Stainless steel

Actuators

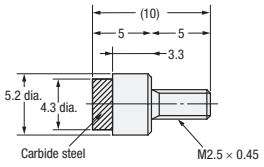
D5SN-TB1/TB2/TB3



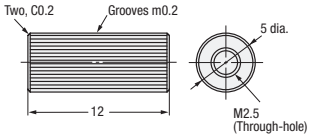
D5SN-TN1



D5SN-TF1



D5SN-TA



PROFILE MEASUREMENT

ZG2-Series – Easy profile measurement

The new ZG2 smart sensor demonstrates that profile measurement with easy operation is no longer impossible. The built-in LCD monitor for an easy and intuitive user interface supports efficient installation and setup. Immediate live feedback of the measurement result is provided in real time.

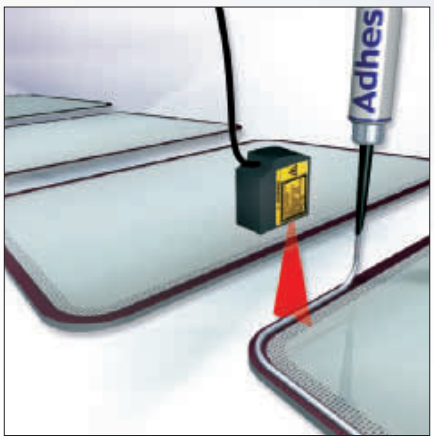
Advanced measurement tasks can be configured within 3 steps to save operation and setting-up time. The fine tuning of the settings can be achieved in seconds.

1 **Adjust sensor head**
Check on LCD display

2 **Select function**
Simple ICON menu

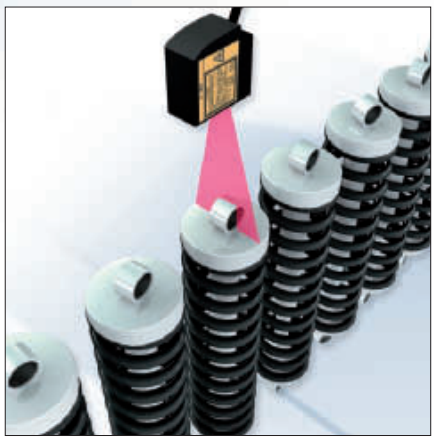
3 **Select range**
Automatic calculation

3 STEP SETTING UP OF MEASUREMENT VIA BUILT-IN LCD DISPLAY



Glue seam inspection

Precise gap measurement in automotive industry

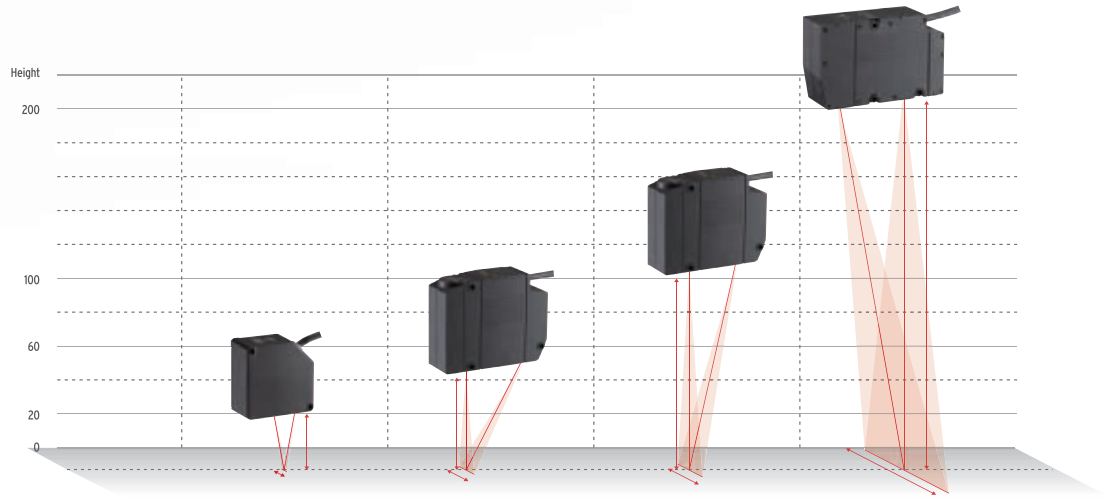


Checking the shape of vehicle structural parts. The wide beam allows the measurment in a single operation.

YOUR BENEFITS

- Intuitive – easy to use
- Live – LCD monitor for display and setup
- Versatile – 18 tools
- Accurate – 5 µm resolution
- Wide profiles – up to 70 mm
- Stable measurements on challenging surfaces

SENSOR HEADS ZG2



PRODUCT NAME	ZG2-WDS3VT	ZG2-WDS8T	ZG2-WDS22	ZG2-WDS70
Height (resolution)	22,3 ± 0,5 mm (0,2 µm)	50 ± 3 mm (1 µm)	100 ± 12 mm (3 µm)	210 ± 48 mm (10 µm)
Width (resolution)	3 mm/631 pixels	8 mm/631 pixels	22 mm/631 pixels	70 mm/631 pixels
Linearity	±0.5% F.S.	±0.5% F.S.	±0.5% F.S.	±0.5% F.S.

see page 160

Easy profile measurement – “teach&go”

The ZG2 enables precise shape measurement on challenging materials and surfaces. An easy and intuitive user interface enables efficient installation, setup and operation. A built-in LCD monitor indicates the measurement result in real time.

- Easy to use – intuitive user interface
- Live – built-in LCD monitor for setup and immediate profile display
- Versatile – 18 measurement tools
- Accurate – 5 µm resolution (3 mm / 631 pixels)
- Wide profiles – up to 70 mm

Ordering information

Sensor heads

Optical method	Sensing distance		Resolution		Order code
	Heigt direction	Width direction	Hight direction	Width direction	
Diffuse reflective	210±48 mm	70 mm	6 µm	111 µm	ZG2-WDS70
Diffuse reflective	100±12 mm	22 mm	2.5 µm	35 µm	ZG2-WDS22
Diffuse reflective	50±3 mm	8 mm	1 µm	13 µm	ZG2-WDS8T
Regular reflective	22.3±0.5 mm	3 mm	0.25 µm	5 µm	ZG2-WDS3VT

Note: - For details, refer the ratings and specifications table.
- Designate the cable length (0.5 m, 2 m) when ordering.

Sensor controllers

Power supply	Output type	Order code
24 VDC	NPN	ZG2-WDC11A*1
	PNP	ZG2-WDC41A

*1 Setup support software for PC is attached

Accessories (order separately)

Real-time parallel output unit

Output type	Order code
NPN	ZG-RPD11
PNP	ZG-RPD41

RS-232C cable

Connecting device	Order code
For personal computer connection (2 m)	ZS-XRS2
For PLC/PT connection (2 m)	ZS-XPT2

Sensor head extension cable

Name	Order code
3 m extension cable	ZG2-XC3CR
8 m extension cable	ZG2-XC8CR
15 m extension cable	ZG2-XC15CR
25 m extension cable	ZG2-XC25CR
Digital equalizer (relay device)	ZG2-XEQ
0.2 m digital equalizer connection cable	ZG2-XC02D

Parallel mounting adaptor

	Order code
For 1 unit	ZS-XPM1
For 2 units or more	ZS-XPM2

Controller link unit

Item	Order code
Controller link unit	ZS-XCN

Memory card

Capacity	Order code
128 MB	F160-N1285
256 MB	F160-N2565

Specifications

Sensor heads

Item		ZG2-WDS70	ZG2-WDS22		ZG2-WDS8T		ZG2-WDS3VT	
Optical system		Diffuse reflective	Diffuse reflective	Regular reflective	Diffuse reflective	Regular reflective	Regular reflective	Diffuse reflective
Measurement range	Height direction	210±48 mm (In the high-precision mode)	100±12 mm	94±10 mm	50±3 mm	44±2 mm	22.3±0.5 mm	10.6±0.4 mm
	Width direction (typical)	70 mm	22 mm		8 mm		3 mm	
Resolution	Height direction*1	6 µm	2.5 µm		1 µm		0.25 µm	
	Width direction	111 µm (70 mm/631 pixels)	35 µm (22 mm/631 pixels)		13 µm (8 mm / 631 pixels)		5 µm (3 mm / 631 pixels)	
Linearity (in the height direction)*2		±0.1% F.S.						
Temperature characteristic*3		0.02% F.S./°C			0.03% F.S./°C		0.08% F.S./°C	
Light source	Type	Visible semiconductor laser						
	Wavelength	658 nm					650 nm	
	Output	5 mW max. output, 1 mW max. exposure (without using optical instruments)					1 mW max.	
	Laser class	Class 2M of EN60825-1 / IEC60825-1 Class IIIB of FDA (21CFR 1040.10 and 1040.11)					Class 2 of EN60825-1 / IEC60825-1 Class II of FDA (21CFR 1040.10 and 1040.11)	
Beam shape (at measurement center distance)*4		120 µm × 75 mm (typical)	60 µm × 45 mm (typical)		30 µm × 24 mm (typical)		25 µm × 4 mm (typical)	
LED		STANDBY : Lights when laser irradiation preparation is complete (indication color: green)						
		LD_ON : Lights when the laser is irradiating (indication color: green)						
Measurement object		Surface of non-transparent objects	Surface of non-transparent / transparent objects					
Environmental resistance	Ambient light intensity	Illumination on the photo-receiving face 7,000 lx max.: Incandescent lamp						
	Ambient temperature	Operating : 0 to 50°C, Storage : -15 to 60°C (with no icing or condensation)						
	Ambient humidity	Operating and storage : 35 to 85 % (with no condensation)						
	Degree of protection	IP66 (IEC60529)					IP67 (IEC60529)	
	Vibration resistance (destruction)	10 to 150 Hz with 0.35 mm single amplitude for 80 min each in X, Y, and Z directions						
	Shock resistance (destruction)	150 m/s², 3 times each in 6 directions (up / down, right / left, forward / backward)						
Materials		Case: Aluminum diecast, Front cover : Glass, Cable insulation : Heat-resistive polyvinyl chloride (PVC), Connector : Zinc alloy or brass						
Cable length		0.5 m, 2 m (flexible cable)						
Weight		Approx. 650 g	Approx. 500 g				Approx. 300 g	
Accessories		Laser labels (EN : 2 labels, FDA : 3 labels), Ferrite core (1), Instruction manual						

*1 Obtained by setting an Omron standard measurement object at the measurement center distance and determing the average height of the beam line. The conditions are given in the table below. However, satisfactory resolution cannot be attained in strong electromagnetic fields.The minimum resolution of the ZG2-WDS8T/WDS3VT is 0.25 ƒÊm, even when the average number of operations is increased. Resolution does not go any lower.

Model	CCD Mode	Average No. of operations	Measurement object	
			Regular reflective	Diffuse reflective
ZG2-WDS70/WDS22/WDS8T	Standard mode	64	Omron standard white alumina ceramic object	
ZG2-WDS3VT	Standard mode		Omron standard mirrored object	Omron standard diffuse reflective object

*2 The tolerance for an ideal straight line obtained by determing the average height of an Omron standard measurement object for the beam line. The CCD high-resolution mode is used. Linearity varies depending on the measurement object.

Model	Measurement object	
	Regular reflective	Diffuse reflective
ZG2-WDS70/WDS22/WDS8T	Omron standard white alumina ceramic object	
ZG2-WDS3VT	Omron standard mirrored object	Omron standard diffuse reflective object

*3 A value attained by using an aluminium jig to secure the distance between the Sensor head and the measurement object. The CCD standard mode is used.

*4 Defined as $1/e^2$ (13.5%) of the center light intensity. This may be influenced when light leakage also exists outside the defined area and the reflectivity of the light around the measurement object is higher than that of the measurement object.

Sensor controllers

Item			ZG2-WDC11/WDC11A	ZG2-WDC41/WDC41A
Input/output type			NPN	PNP
No. of connectable Sensor Heads			1 per Controller	
No. of connectable Controllers			2	
Measurement cycle *1			16 ms (high-precision mode), 8 ms (standard mode), 5 ms (high-speed mode)	
Min. display unit			10 nm	
Display range			-999.99999 to 999.99999	
Display		LCD monitor	1.8-inch TFT colour LCD (557x234 pixels)	
		LEDs	• Judgment indicators for each task (indication colour: orange): T1, T2, T3, T4 • Laser indicator (indication colour: green): LD_ON • Zero reset indicator (indication colour: green): ZERO • Trigger indicators (indication colour: green): TRIG	
External interface	Input/output signal lines	Analog outputs	Select voltage or current (using the sliding switch on the bottom surface) • Voltage output: .10 to 10 V, output impedance: 40 Ω • Current output: 4 to 20 mA, maximum load resistance: 300 Ω	
		Judgment output (ALL-PASSING/ERROR)	NPN open collector 30 VDC, 50 mA max. Residual voltage: 1.2 V max.	PNP open collector 50 mA max. Residual voltage: 1.2 V max.
		Trigger auxiliary output (ENABLE/GATE)		
		Laser stop input (LD-OFF)	ON: 0 V short or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	ON: Power supply voltage short or power supply voltage -1.5 V max. OFF: Open (leakage current: 0.1 mA max.)
		Zero reset input (ZERO)		
		Measurement trigger input (TRIG)		
		Bank switching input (BANK A, B)		
	Serial I/O	USB2.0	1 port, full speed (12 Mbps), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
	Parall output*2	Output	18 - terminal	
Main functions		No. of settings banks	16	
		Sensitivity adjustment	Multi, High-speed multi, Auto, Fixed	
		Measurement items	Height, 2-point Step, 3-point Step, Edge position, Edge width, Angle, Intersection coordinates, Intersection angle, Sectional area (up to eight items can be measured simultaneously)	
		Auxiliary functions	Filter, Laser power adjustment, Position correction (height, position, lope), Linked operation, Point of inflection measurement	
		Profiles saved	16 profiles (1 profile per bank)	
		Trigger modes	External trigger / continuous	
Ratings		Power supply voltage	21.6 to 26.4 VDC (including ripple current)	
		Current consumption	0.8 A max. (per sensor head)	
		Insulation resistance	20 MΩ at 250 V between lead wires and Controller case	
		Dielectric strength	1,000 VAC, 50 / 60 Hz for 1 min between lead wires and Controller case	
Environmental resistance		Ambient temperature	Operating : 0 to 50°C, Storage : -15 to 60°C (with no icing or condensation)	
		Ambient humidity	Operating and storage : 35 to 85 % (with no condensation)	
		Degree of protection	IP20 (IEC 60529)	
		Vibration resistance (destruction)	Vibration frequency: 10 to 150 Hz, single amplitude: 0.35 mm, acceleration: 50 m/s²	
		Shock resistance (destruction)	150 m/s², 3 times each in 6 directions (up/down, right/left, forward/backward)	
Material			Case : Polycarbonate (PC), Cable insulation : Heat-resistive polyvinyl chloride (PCV)	
Cable length			2 m	
Weight			Approx. 300 g (including cable) (Packed state: Approx. 450 g)	
Accessories			ZG2-WDC_1: Large Ferrite Core (1 piece), Instruction Manual ZG2-WDC_1A: Large Ferrite Core (1 piece), Small Ferrite Core (2 pieces), Instruction Manual, Setup Support Software (CD-ROM), USB cable (1 m)	

*1 The image input periods listed here are for fixed/auto sensitivity. The image input period will be longer for multi-sensitivity, high-speed multi-sensitivity, or other settings. When the high-power mode is ON, the shortest image input period is 95 ms regardless of the setting of the CCD mode. Use the eco monitor in the RUN mode to determine the actual image input period.

*2 when ZG-RPD is mounted

Data storage unit

Item			ZG2-DSU11	ZG2-DSU41
Input/output type			NPN	PNP
No. of connectable Controllers			2[*1]	
Connectable controllers			ZG2-WDC11/WDC41	
External interface	Input/output signal lines	Inputting starting/ terminating logging	ON: 0 V short or 1.5 V max. OFF: Open (ileakage current : 0.1 mA max.)	ON: Power supply voltage short or power supply voltage -1.5 V max. OFF: Open (leakage current: 0.1 mA max.)
		Judgment output (HIGH/PASS/LOW/ERROR)	NPN open collector 30 VDC, 50 mA max. Residual voltage : 1.2 V max.	PNP open collector 50 mA max. Residual voltage : 1.2 V max.
	Serial I/O	USB2.0	1 port, full speed (12 Mbps), MINI-B	
		RS-232C	1 port, 115,200 bps max.	
Functions	No. of logged data[*2]	Memory of the main unit	Profiles saved: 5,120 profiles Measurement values saved: 65,000 values max.[*3]	
		Memory card (256 MB)[*4]	Profiles saved: 35,328 profiles max. (256 profiles x 138 files) Measurement values saved: 7,150,000 values max. (65,000 values x 110 files)	
	Logging trigger functions		External triggers, data triggers (self-triggers), and time triggers	
	External banks functions		4096	
	Other functions		Alarm output functions	
Ratings		Power supply voltage	21.6 to 26.4 VDC (including ripple current)	
		Current consumption	0.5 A max.	
Environmental resistance		Ambient temperature	Operating : 0 to 50°C, Storage: 0 to 60°C (with no icing or condensation)	
		Ambient humidity	Operating and storage : 35 to 85% (with no condensation)	
Material			Case : Polycarbonate (PC)	
Cable length			2 m	
Weight			Approx. 280 g	
Accessories			Ferrite Core (1 piece), Instruction Manual	

[*1] The controller link unit is necessary for linking.
[*2] Data is saved in the memory of the main unit during logging. The data is automatically saved in a memory card after logging is completed. The maximum number of logging differs according to set conditions. For details, refer to the Users Manual.
[*3] Measurement values for 65,000 measurements can be saved even when two sensor controllers are connected and each performs eight tasks.
[*4] The value is the maximum number achieved in the following conditions:
- One sensor controller performs one measurement task.
- Either profiles or measurement values are logged.

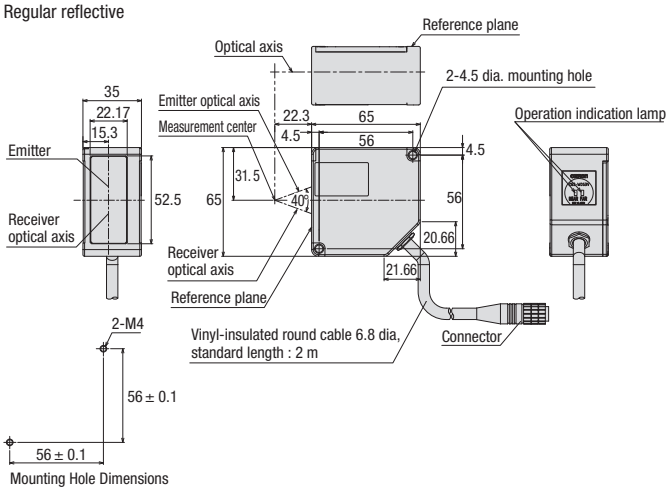
Dimensions

(Unit: mm)

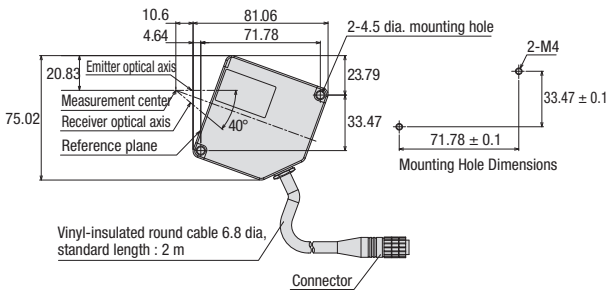
Sensor heads

ZG2-WDS3VT

Regular reflective

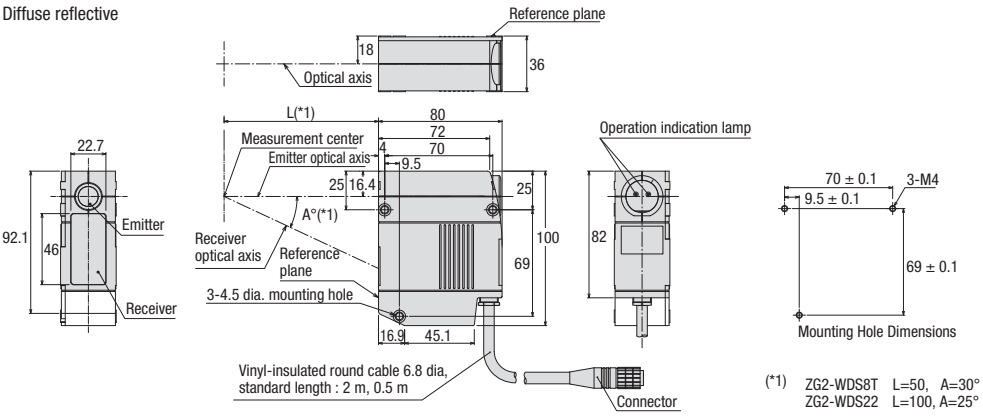


Diffuse reflective



ZG2-WDS8T/WDS22

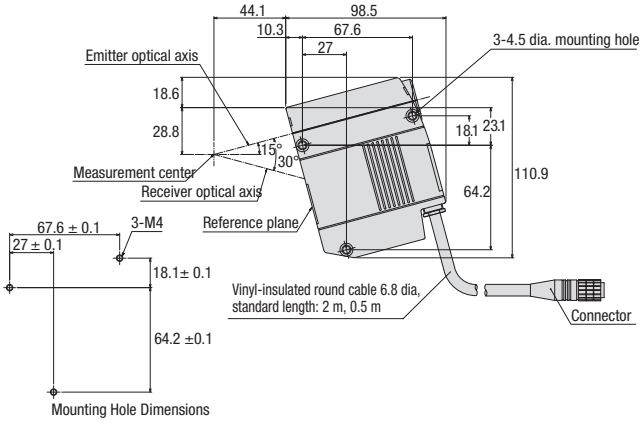
Diffuse reflective



(*1) ZG2-WDS8T L=50, A=30°
ZG2-WDS22 L=100, A=25°

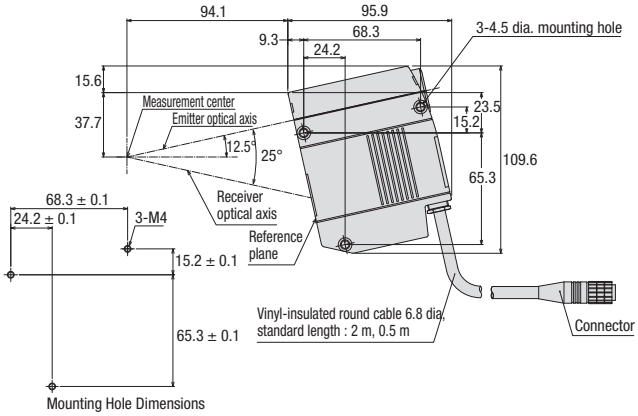
ZG2-WDS8T

Regular reflective



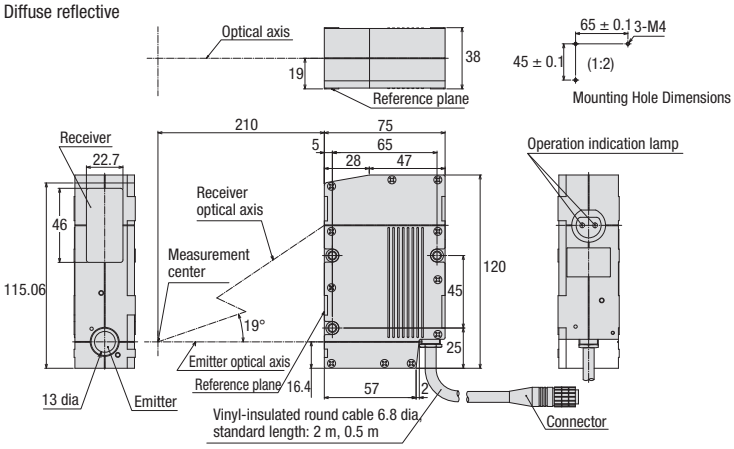
ZG2-WDS22

Regular reflective



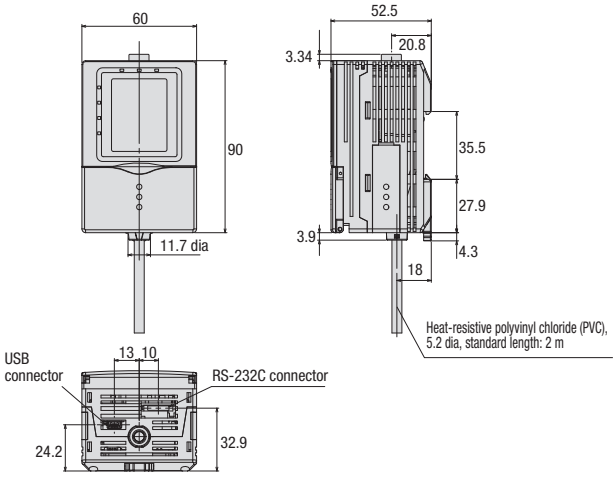
ZG2-WDS70

Diffuse reflective



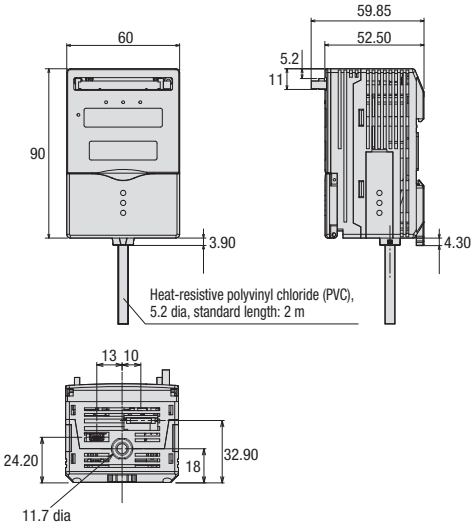
Sensor controller

ZG2-WDC11/WDC41



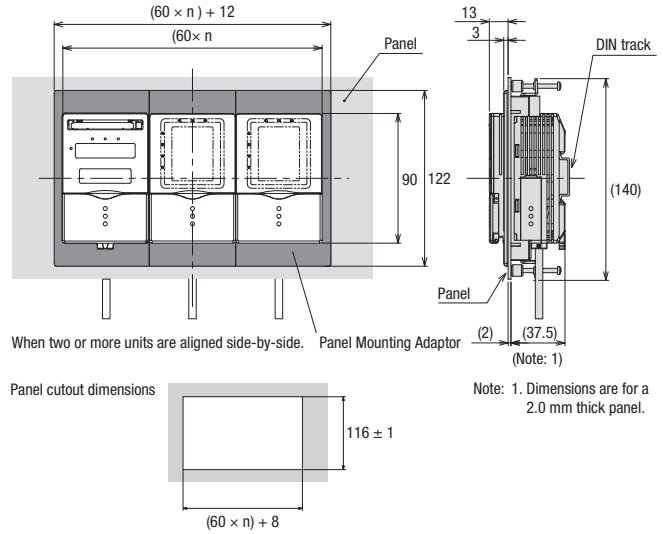
Data storage unit

ZG2-DSU11/DSU41



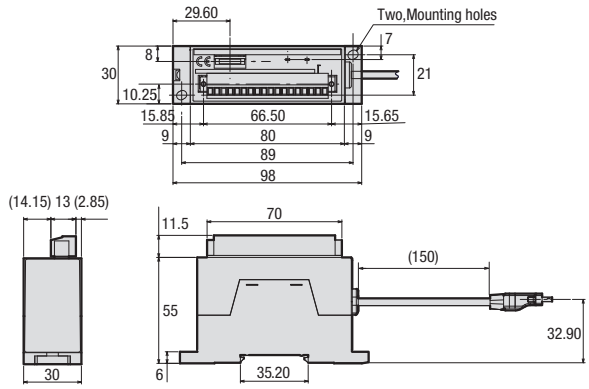
Panel mounting adaptor

ZG-XPM1/XPM2 (dimensions for mounting to a control panel)



Real-time parallel output unit

ZG-RPD11/RPD41



POSITION / DIAMETER / WIDTH MEASUREMENT

ZX-GT smart laser micrometer: Accurate and fast on all surfaces

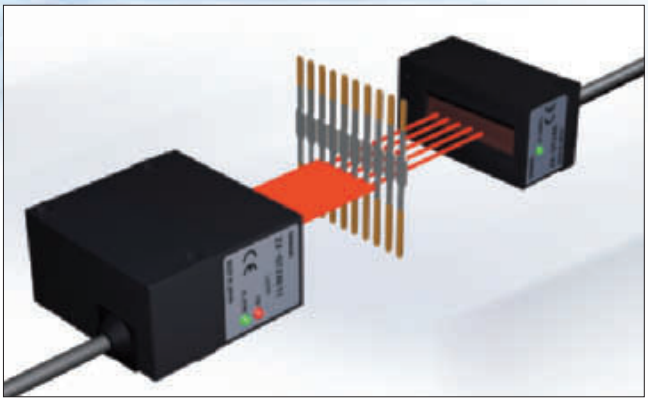
The new ZX-GT smart laser micrometer complements Omron's Smart Laser Measurement platform. ZX-GT is able to detect edges, measure diameters of objects and calculate precisely the position on all kind of materials. Based on CCD technology ZX-GT achieves high accuracy and speed under difficult environmental conditions.

Transparent objects, reflective surfaces or different positions do not have an influence on the result. The PC Smart Monitor software helps to easily setup and configure the laser micrometer.

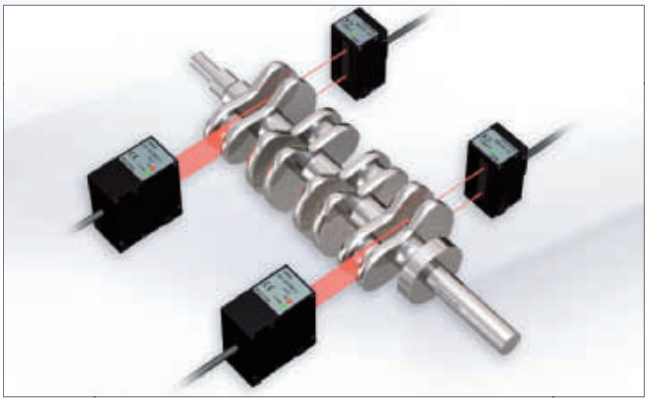
YOUR BENEFITS

- High accuracy: 10 µm
- All surfaces
- Long sensing distance: < 500 mm
- Line width up to 28 mm
- Calculation unit for multiple heads

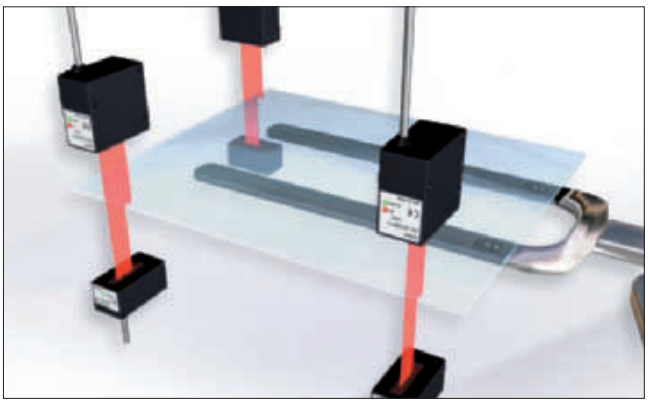
Note: For sensing distances up to 15m, area width up to 2m and cm accuracy, refer to F3EM measuring light curtains in INDUSTRIAL SENSING GUIDE



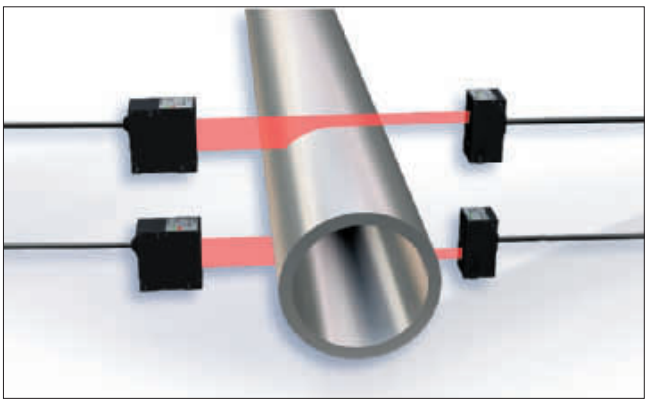
Electronic components – lead-pitch and diameter measurement



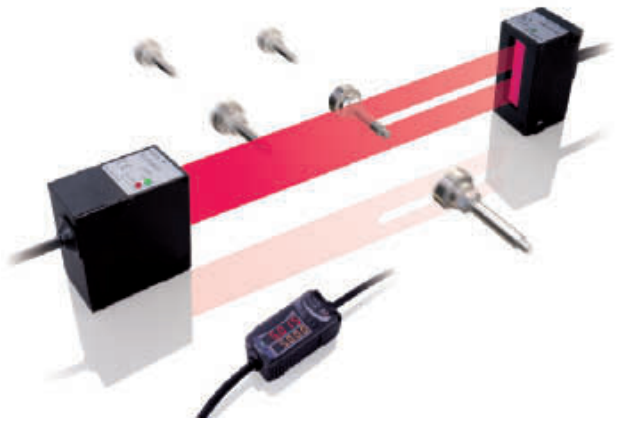
Automotive – diameter inspection of large tubes



LCD – glass-edge measurement



Automotive – diameter measurement of large-scale pipe



Smart laser micrometer

- High accuracy: 5-10 µm
- All surfaces
- Long sensing distance: < 500 mm
- Line width up to 28 mm
- Calculation unit for multiple heads
- Fast sampling time: 0.5 ms
- PC software for setup

Ordering information

Sensors

Type	Optical system	Measuring width	Sensing distance	Resolution	Output type	Order code
Separate type	Through-beam	28 mm	0 to 500 mm	10 µm	NPN	ZX-GT28S11
					PNP	ZX-GT28S41
Integrated type			40 mm		NPN	ZX-GT2840S11
					PNP	ZX-GT2840S41

Controller

Power supply	Output type	Order code
DC	NPN	ZX-GTC11
	PNP	ZX-GTC41

Accessories (order separately)

Set of interface unit and setup software PCs

Output type	Order code
NPN	ZX-GIF11A
PNP	ZX-GIF41A

Interface unit(RS-232C/binary output)

Power supply	Output type	Order code
DC	NPN	ZX-GIF11
	PNP	ZX-GIF41

Setup software PCs

Name	Order code
Smart monitor GT	ZX-GSW11

Calculating units

	Order code
Calculating unit	ZX-CAL2

Receiver-controller extension cable

Cable length	Quantity	Order code	
		Standard cable	Flexible cable
1 m	1 m	ZX-XGC1A	ZX-XGC1R
2 m		ZX-XGC2A	ZX-XGC2R
5 m		ZX-XGC5A	ZX-XGC5R
8 m		ZX-XGC8A	ZX-XGC8R
20 m		ZX-XGC20A	ZX-XGC20R

Up to two extension cables can be connected. However, be sure to limit the total extension cable length between the receiver and the controller to 30 meters (including the receiver cable).

Specifications

Sensor

Item	ZX-GT28S11	ZX-GT2840S11	ZX-GT28S41	ZX-GT2840S41
Output type	NPN		PNP	
Appearance	Separate type	Integrated type	Separate type	Integrated type
Light source	Visible semiconductor laser diode (wavelength 650 nm, CLASS 1 of EN60825-1/IEC60825-1, CLASS of FDA(21CFR 1040.10 and 1040.11)			
Measuring width	28 mm			
Sensing distance	0 to 500 mm	40 mm	0 to 500 mm	40 mm
Minimum sensing object	0.5 mm dia.*1	0.2 mm dia.	0.5 mm dia.(*1)	0.2 mm dia.
Linearity	±0.1% F.S.*2			
Resolution	10 µm (number of process values to average: 16)*3			
Temperature characteristic	±0.01% F.S/C*4			
Indicators (emitter)	Laser ON indicator (green), laser alarm indicator (red)			
Indicator (receiver)	Optical axis setting indicator (green)			
Laser OFF input/sync input	ON: Short-circuited with 0 V or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)		ON: Short-circuited with power supply voltage or power supply voltage -1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	
Laser deterioration alarm output	NPN open-collector output 30 VDC 20 mA max. Residual voltage 1.2 V max.		PNP open-collector output 30 VDC 20 mA max. Residual voltage 2 V max.	
Power consumption (emitter)	30 mA max.			
Power supply voltage (emitter)	24 VDC +10%, -15% ripple (p-p) 10% max.			
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min			
Insulation resistance	20 MΩ (at 500 VDC megger)			
Operating ambient illumination (emitter)	3,000 lx (incandescent light)			
Operating ambient illumination (receiver)	1,000 lx (incandescent light)*5			
Ambient temperature	Operating: 0 to +40°C, storage: -15 to +50°C (with no icing or condensation)			
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)			
Vibration resistance (durability)	10 to 150 Hz single-amplitude: 0.75 mm for 80 min each in X, Y and Z directions			
Degree of protection	IEC60529 IP40			
Cable length	2 m			
Material	Case: aluminum die-cast, Lens: glass			
Weight (packed state)	Approx. 550 g	Approx. 570 g	Approx. 550 g	Approx. 570 g
Accessories	Laser warning labels, instruction sheet			

F.S.: 28 mm measuring range of receiver

*1 Distance between emitter and receiver: 500 mm, measurement object at 250 mm from receiver. Glass ends of chamfer 0.1 mm or more can be detected in glass edge measurement mode. (at binary level 70%)
*2 Linearity is given to be a typical error with respect to an ideal straight line when the distance between the emitter and receiver is 100 mm and light is blocked at a distance of 50 mm from the receiver. (On the ZX-GT2840_, the measurement object is measured at a distance of 20 mm from the receiver.)
*3 The amount of fluctuation (±3 σ) in the analog output when the distance between the emitter and receiver is 100 mm and a ZX-GTC_ is connected
*4 Change in the light cutoff value on one side when the distance between the emitter and receiver is 100 mm and the light is half-cutoff at a distance of 50 mm from the receiver (On the ZX-GT2840_, the measurement object is measured at a distance of 20 mm from the receiver.)
*5 Standard mode (NORM) used

Controller

Item		ZX-GTC11	ZX-GTC41
Output type		NPN	PNP
Measurement cycle*1		1.5 ms (standard mode (NORM)) 0.5 ms (high-speed mode (FAST))*2	
Samples to average		1/2/4/8/16/32/64/128/256/512/1024/2048/4096	
Analog output*3		For current output: 4 to 20 mA/F.S., max. load resistance 300 Ω For voltage output: ±4 V, (±5 V, 1 to 5 V*4), output impedance 100 Ω	
Timing input, bank switching input, zero reset input, reset input		ON: short-circuited with 0 V or 1.5 V max. OFF: Open (leakage current: 0.1 mA max.)	ON: short-circuited with power supply voltage or power supply voltage -1.5 V max. OFF: Open (leakage current: 0.1 mA max.)
HIGH/PASS/LOW Judgment output*5 Sync output*6		NPN open-collector output 30 VDC 50 mA max. Residual voltage 1.2 V max.	PNP open-collector output 30 VDC 50 mA max. Residual voltage 2 V max.
Indicator		Judgment output indicator: HIGH (orange), PASS (green), LOW (orange) Main display (red) sub-display (yellow) bank 1/2 (orange), zero reset (green)	
Main functions	Number of registered setups	2 banks	
	Measurement mode	Interrupted beam width measurement, incident beam width measurement, outer diameter measurement, center position measurement, IC lead pitch, IC lead width judgment, specified edge measurement, wire position measurement, glass edge position measurement	
	Display during measurement	Measured value, resolution, threshold, voltage output value, current output value (number of display digits can be changed)	
	Zero reset functions	Offset setting of zero reset value, zero reset value memory	
	Hold	Sample hold, peak hold, bottom hold, peak-to-peak hold, average hold, delay hold	
	Timer functions	ON-delay, OFF-delay, one-shot	
	Adjustment functions	Optical axis adjust mode/light intensityt writing mode, variable binary level, variable edge filter, analog output scaling	
	Calculation	2 possible on up to two controllers (calculation Unit ZX-CAL2 is required for connecting controllers to each other.) A-B, A+B, width	
	Other	Measurement cycle setting, threshold setting, hysteresis setting, initialization, key lock	
Temperature characteristic		±0.005% F.S./°C	

Item	ZX-GTC11	ZX-GTC41
Current consumption	150 mA max. (including receiver)	
Power supply voltage	24 VDC +10%, -15% ripple (p-p) 10% max.	
Dielectric strength	1,000 VAC, 50/60 Hz for min	
Insulation resistance	20 MΩ (at 500 VDC megger)	
Ambient temperature	Operating: 0 to +50°C, storage: -15 to +60°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)	
Vibration resistance(durability)	10 to 150 Hz single-amplitude: 0.35 mm for 80 min each in X, Y and Z directions	
Degree of protection	IEC60529 IP20	
Cable length	2 m	
Material	Case: PBT (polybutylene terephthalate), cover: Polycarbonate	
Weight (packed state)	Approx. 330 g	
Accessories	Instruction sheet	

*1 The first response time is “measurement cycle x (number of samples to average setting + 1) + 1 ms” max. For the second response time onwards, the specified measurement cycle time is output.
*2 The response time in the high-speed mode (FAST) for the IC lead pitch and IC lead width judgment modes is 1 ms.
*3 Current/voltage can be switched using the switch provided on the rear of the Controller.
*4 Can be set by the analog output scaling function.
*5 The error (ERR) state is displayed when all HIGH/PASS/LOW outputs turn OFF.
*6 Normally, wire the sync output wire directly to the emitter's sync input wire and run the controller in the standard mode. On an NPN type controller, use an NPN type emitter, and on a PNP type controller, use a PNP type emitter. Wiring of the sync wires is not required when the controller is run in the high-speed mode.
(Note, however, that the controller becomes more susceptible to the influence of ambient light in this case.)

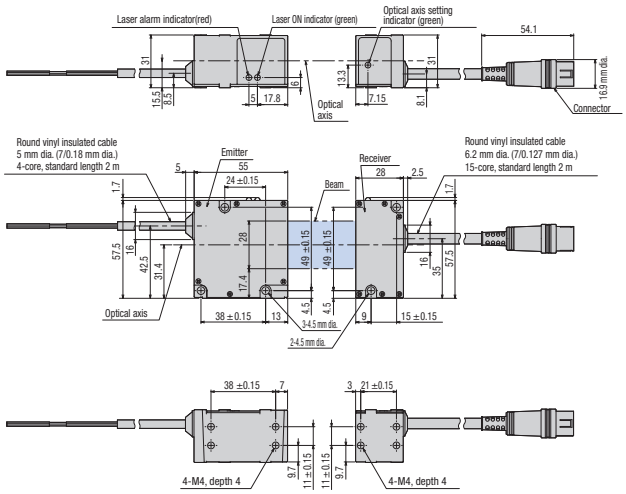
Interface unit

Item	ZX-GIF11/-GIF11A	ZX-GIF41/-GIF41A
Compatible controller	ZX-GTC11	ZX-GTC41
Indicator	Power ON (green), controller communications (orange), controller communications error (red), RS-232C communications (orange), RS-232C communications error (red), binary output (orange)	
Communications port	RS-232C (9-pin D-sub connector)	
12-bit binary output (D11 toD0, GATE)	NPN open-collector output 30 VDC 20 mA max. Residual voltage 1.2 V max.	PNP open-collector output 30 VDC 20 mA max. Residual voltage 2 V max.
Power supply voltage	Supplied from controller (power consumption: 60 mA max.)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min	
Insulation resistance	20 MΩ (at 500 VDC megger)	
Ambient temperature	Operating: 0 to +50°C, storage: -15 to +60°C (with no icing or condensation)	
Ambient humidity	Operating and storage: 35 to 85% (with no condensation)	
Vibration resistance(durability)	10 to 150 Hz single-amplitude: 0.35 mm for 80 min each in X, Y and Z directions	
Degree of protection	IEC60529 IP20	
Cable length	RS-232C 0.5 m, binary output 2 m	
Material	Case: PBT (polybutylene terephthalate), cover: Polycarbonate	
Weight (packed state)	ZX-GIF_1A: Approx. 550 g ZX-GIF_1: Approx. 330 g	
Accessories	ZX-GIF_1A: Setup coftware (CD-ROM), 2 clamps, instruction sheet ZX-GIF_1: 2 clamps, instruction sheet	

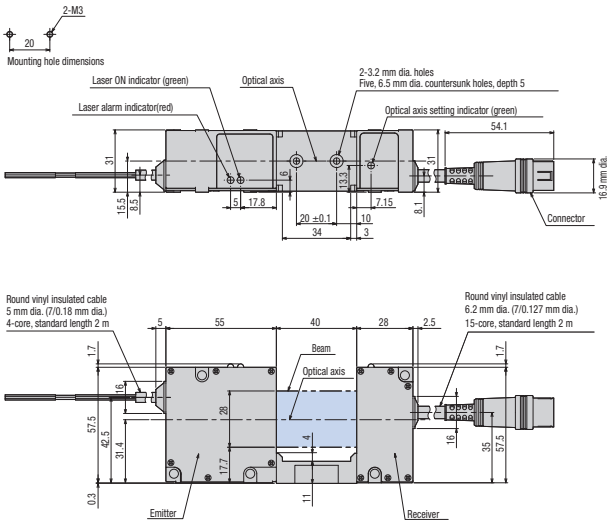
Dimensions

Sensor

ZX-GT28S11/-GT28S41 (separate type)

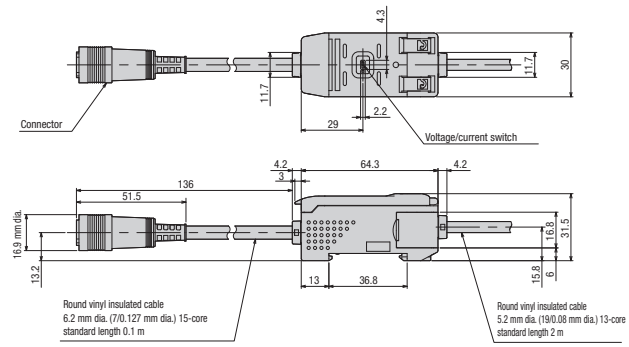


ZX-GT2840S11/-GT2840S41 (integrated type)


2-M3
20
Mounting hole dimensions
Laser ON indicator (green)
Optical axis
2-3.2 mm dia. holes Five, 6.5 mm dia. countersunk holes, depth 5
Laser alarm indicator(red)
Optical axis setting indicator (green)
54.1
Connector
Round vinyl insulated cable 5 mm dia. (7/0.18 mm dia.) 4-core, standard length 2 m
Round vinyl insulated cable 6.2 mm dia. (7/0.127 mm dia.) 15-core, standard length 2 m
Beam
Optical axis
Emitter
Receiver

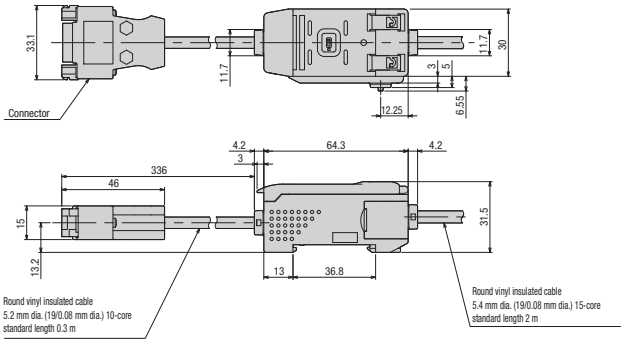
Controller

ZX-GTC11/-GTC41


Connector
Voltage/current switch
Round vinyl insulated cable 6.2 mm dia. (7/0.127 mm dia.) 15-core standard length 0.1 m
Round vinyl insulated cable 5.2 mm dia. (19/0.08 mm dia.) 13-core standard length 2 m

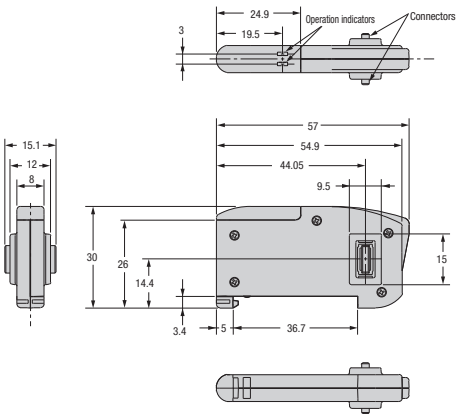
Calculating unit

ZX-GIF11/-GIF41


Connector
Round vinyl insulated cable 5.2 mm dia. (19/0.08 mm dia.) 10-core standard length 0.3 m
Round vinyl insulated cable 5.4 mm dia. (19/0.08 mm dia.) 15-core standard length 2 m

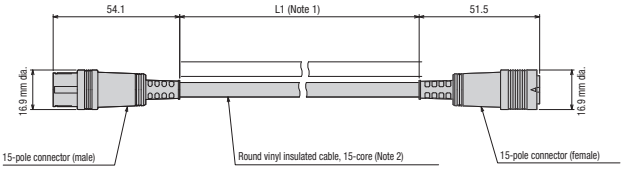
Interface unit

ZX-CAL2



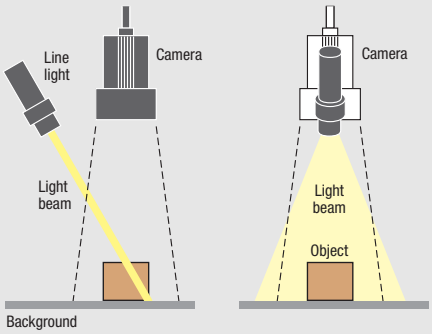
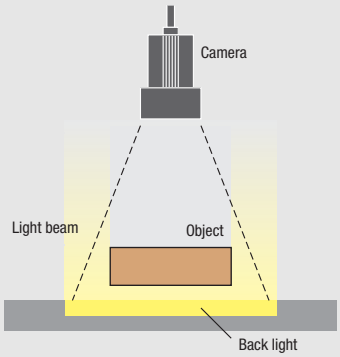
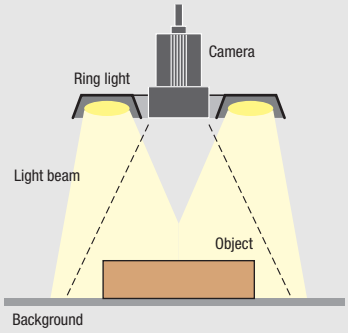
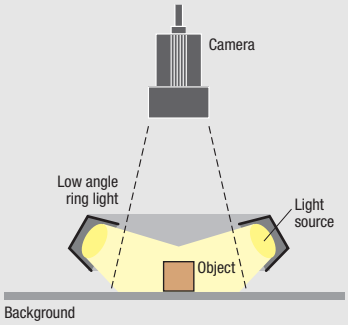
Receiver-controller extension cable

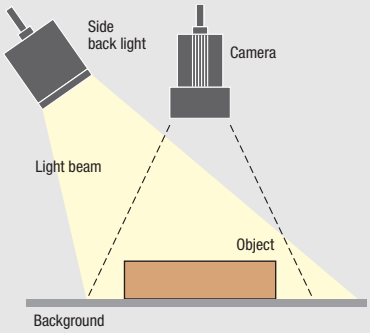
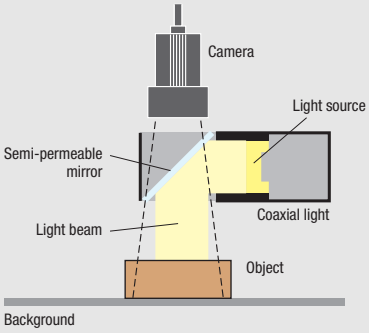
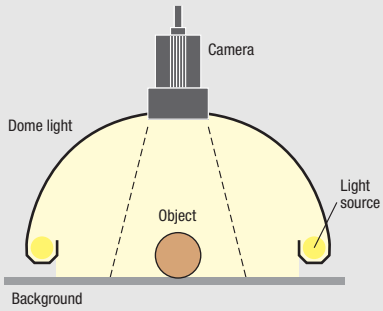
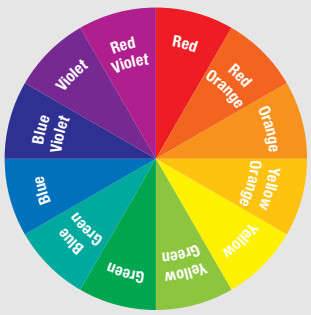
ZX-XGC_A/-XGC_R

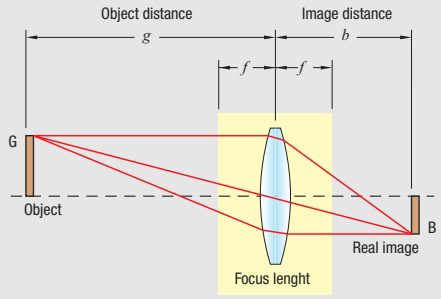
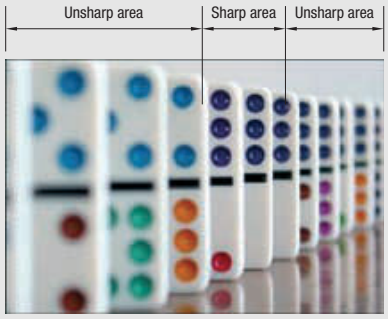
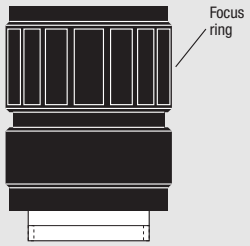


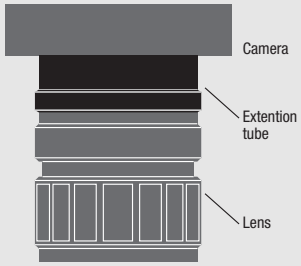
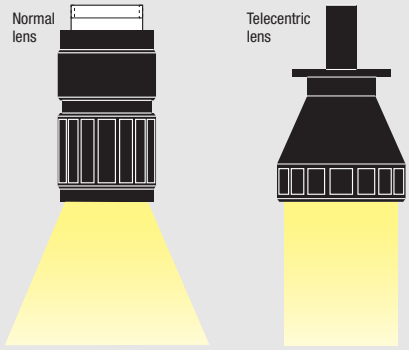
Note 1: ZX-XGC1A/R : 1M
ZX-XGC2A/R : 2M
ZX-XGC5A/R : 5M
ZX-XGC8A/R : 8M
ZX-XGC20A/R : 20M

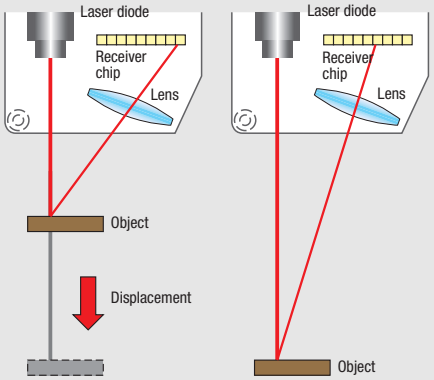
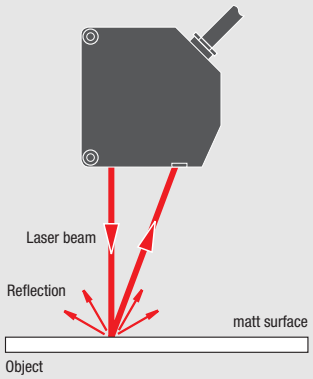
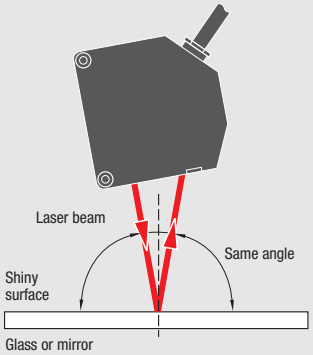
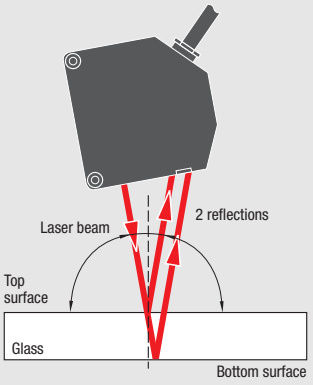
Note 2: Standard cable: 6.2 mm dia.
Flexible cable: 6.1 mm dia.

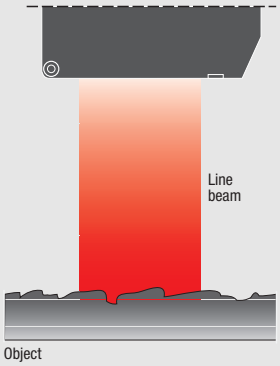
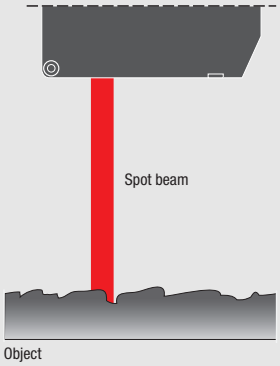
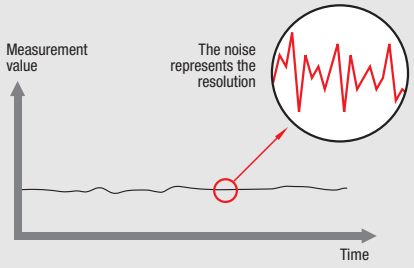
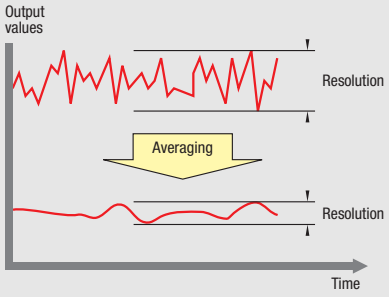
Item	Explanatory diagram	Meaning
Line light		With a line light a straight line is projected on the object. This allows to inspect the height of an object. Applications: • Width/length measurement of parts • Height measurement of parts • Light section method in large parts
Back light		The backlight is placed behind the object into the direction towards the camera. The main purpose is to highlight the edges of an object for contour inspections. Applications: • Width measurement • Counting • Contour searching
Ring light		A ring light is a direct light and creates an equal light on the whole surface of the object (bright field). It is used with the direction towards the object. Applications: • Universal light source for light • Uniform illumination of the checking field • High illuminance, so suited for fast processes
Low angle ring light		The low angle ring light is not lighting directly into the lens, but from the side. The lighted field appears dark, distortions appear bright. Applications: • Visualisation of surface structures (contours, scratches, cracks). • Highlighting striking structures on the object. • Highlighting contour parts without software-filtering (optical image processing).

Item	Explanatory diagram	Meaning
Side back light		Light comes from the observation direction down to the object or to the side to avoid reflection. Applications: • Highlight edges and scratches. • Uniform illumination diffuse reflective surfaces. • Check completeness, presence control, read codes or signs, defect inspection
Coaxial light		The lighting comes from the observation direction down to the level of the object. Coaxial light comes from the observation direction requires vertical arrangement of the lens to the observed surface. Applications: • Uniform illumination from diffuse reflective up to shiny surfaces.
Dome light		The dome light is an indirect light, where the dome is reflecting the light to the object from every angle. This leads to a more homogeneous illumination on the surface of the object. Illumination comes from the observation direction down to the level of the object. Applications: • Highly structured parts, surface, texture, crack-control, safety-related parts, code and character recognition, etc. • Uniform illumination of diffuse reflective surfaces.
What are complementary colours?		The complementary colours are in the colour circle exactly on the opposite side. Important: An object appears dark, when the light colour is its complementary colour, and it appears bright, if the light is a similar colour of its own.

Item		Explanatory diagram	Meaning
General about lenses	Focal lenght		Important terms: • object distance • image distance • focal length Lenses with different focal length generate different image sizes, by having the same distance to the object
	Depth of focus		If the depth of focus is high, the sharp area is becoming larger.
	Focus ring		The focus ring is increasing the distance between the lens and CCD chip. This decreases the minimum distance of the camera to the object, where you still receive a sharp image.
	Aperture	 Lens with a opened aperture Eg 1.4 Lens with a medium aperture Eg 7 Lens with a closed aperture Eg 11	The aperture defines the opening of the lens, which can be increased or decreased. The size controls the amount of light that is received on the CCD chip. Small aperture numbers (such as 1.4 or 2.8) = wide opened lens. Large aperture numbers (for example, 11 or 16) = low opened lens.

Item		Explanatory diagram	Meaning
Extension tube			An extension tube is a ring between camera and lens. So the distance between the lens and CCD chip will be increased. There are extension tube in different sizes, multiple rings can be combined.
Lens selection	Focal length calculation	Characteristics which you need for selecting the correct focal length. b = width of CCD- Chips B = width of object f = focal length D = working distance c = conversion factor chip size $f = \frac{b \times D}{B} \times c$ Example: The width of a 1/3"-chip is 4.8 mm, working distance = 300 mm, image field = 85 mm. $f = \frac{b \times D}{B} \times 0.72 = \frac{4.8\ \text{mm} \times 300\ \text{mm}}{85\ \text{mm}} \times 0.72 = 12.2\ \text{mm} \approx 12\ \text{mm}$	
Special lenses	Telecentric lenses		By using telecentric lens, objects can be captured without perspective distortion. Another advantage is that the size of the object, independent from the distance to the lens or the position in the field of view. These lenses are therefore excellent for measurement of objects.

Item	Explanatory diagram	Meaning
Displacement measurement by laser triangulation		Triangulation means calculation of distance resp. displacement by measuring one angle of a triangle. The reflected light is focussed on a semiconductor receiver element and the position is a representation of the angle. From this angle the sensor can calculate the distance to the object.
Diffuse reflection		Matt surfaces reflect light in all directions. The sensor can “see” the spot on the surface. For diffuse reflection the mounting angle of the sensor head is not critical.
Regular reflection		Shiny surfaces reflect light in only 1 direction. Sensor head must be mounted accurately in regular reflection position, to “see” the spot on the surface. Incidence and reflection angle are equal.
Glass measurement		Transparent materials create reflections for each crossing of different optical density. This results in a reflection for the top surface and the bottom surface of glass. The thickness can be calculated out of these reflections.

Item		Explanatory diagram	Meaning
Line/spot beam	Line beam		The line is averaging the surface shape of the object.
	Spot beam		The spot is focussing the light which leads to higher intensity. This is beneficial for surfaces absorbing a lot of light.
Resolution			The "noise" of the measurement represents the resolution. It is the minimum difference in the measurement, which can be detected. The resolution depends on: • Material (colour, surface, etc.) • Static or moving condition (moving is e.g. 10 to 100 times worse) • Sensor characteristic (optical + electrical noise)
Average			This function is used to get a more stable and representative result. The average of several measurement values is calculated and given as the result. The number of measurements for this calculation is variable. The averaging has 2 effects: • Improvement of the resolution • Increase the response time
Accuracy/precision			Accuracy is the degree of how close the result is to the real value. Precision is the degree of reproducibility.

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